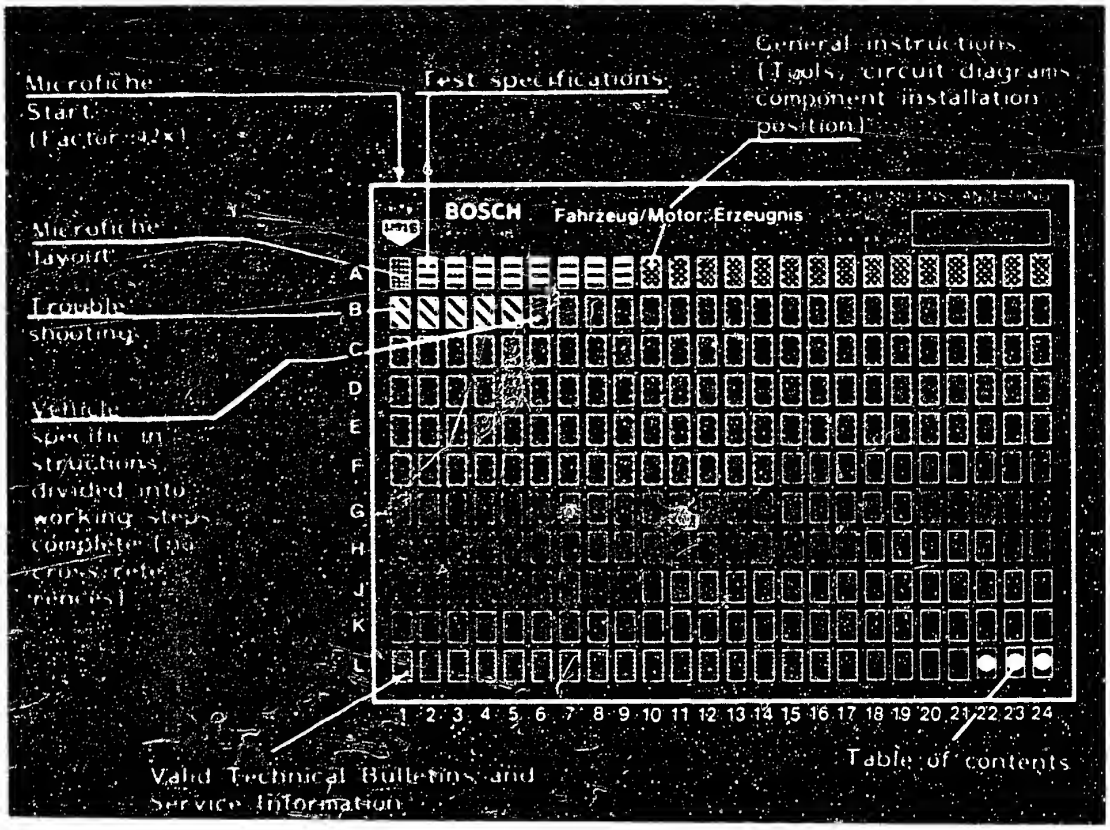
Microfiche layout



1. Read from left to right

2. Title of microfiche (appears on each coordinate)

E 16	Product/assembly/test step Vehicle/engine	

Coordinate

3. Limits of section

Beginning	Mid-section	End	One-page section

4. Purely vehicle-specific passages in the text are marked with a vertical bar.

5. Reference to relevant working steps in the test specifications, e.g. coordinate C6.

C6

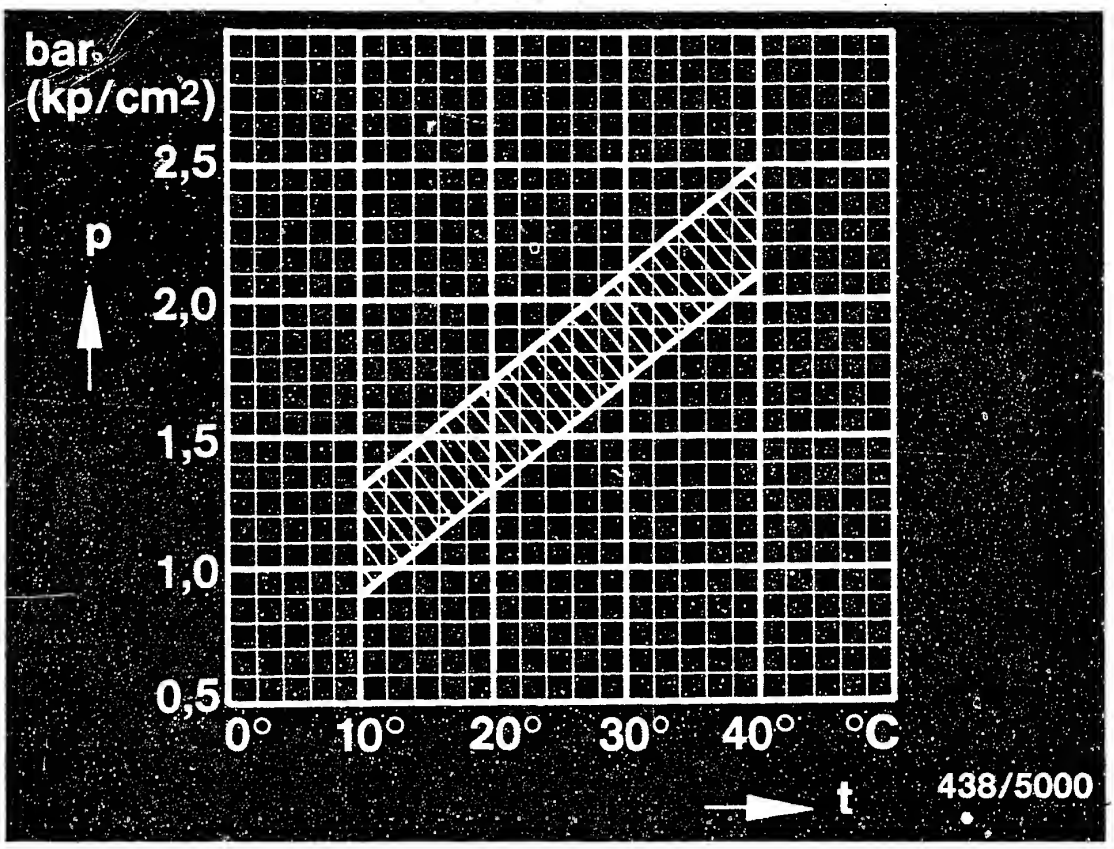
A1	Trouble-shooting plan	↓

1. Test specifications

1.1 Electric fuel pump

C1

Test step	Test specifications
Fuel delivery:	min. 750 cm^3/30 s



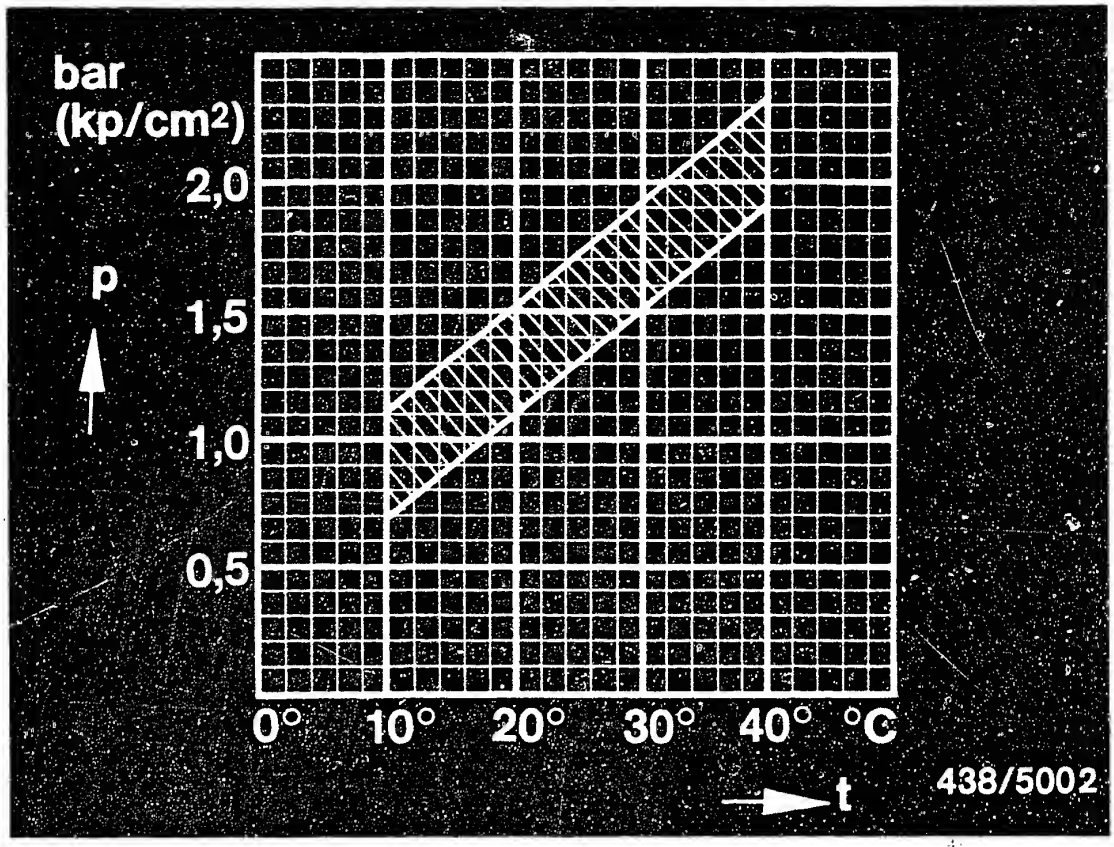
p = Control pressure (gauge pressure)
t = Ambient temperature

C9

1.2 Control pressure "cold"

Part No. of warm-up regulator: 0 438 140 011

Basic version



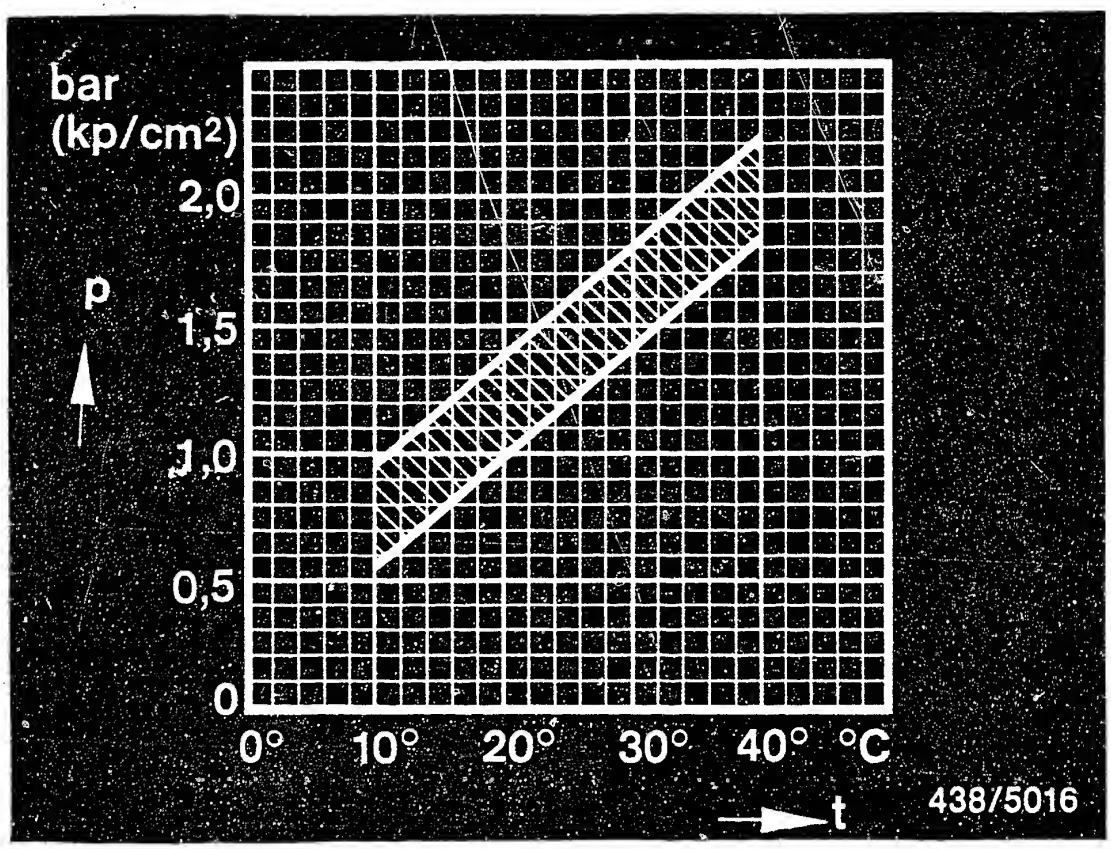
p = Control pressure (gauge pressure)
t = Ambient temperature

C9

• Control pressure "cold"

Part No. of warm-up regulator: 0 438 140 073
0 438 140 074

Basic version



p = Control pressure (gauge pressure)
t = Ambient temperature

C9

• Control pressure "cold"

Part No. of warm-up regulator: 0 438 140 073
0 438 140 074

Basic version

Test step	Test specifications*

1.3 Control pressure "warm" — **C9**

Warm-up regulator

0 438 140 011
0 438 140 118
0 438 140 119

3.4...3.8bar(3.5...3.9kgf/cm²)

1.4 Primary pressure — **D1**

Fuel distributor

0 438 100 005
0 438 100 022
0 438 100 023

Test specif. 4.5...5.2bar(4.6...5.3kgf/cm²)
Setting val. 4.7...4.9bar(4.8...5.0kgf/cm²)

0 438 100 059
0 438 100 061
0 438 100 079

Test specif. 4.7...5.4bar(4.8...5.5kgf/cm²)

0 438 100 082
0 438 100 100

Setting val. 4.9...5.1bar(5.0...5.2kgf/cm²)

1.5 Leak test — **D10**

	Fuel accumulator 0 438 170 017/028		0 438 170 001 0 438 170 010/011
	up to FD 931 (identified by blue spot)	from FD 932	
Minimum pressure after 10 minutes:	2.2 bar (2.3kgf/cm²)	2.5 bar (2.6kgf/cm²)	2.0 bar (2.1kgf/cm²)
20 minutes:	2.0 bar (2.1kgf/cm²)	2.4 bar (2.5kgf/cm²)	1.7 bar (1.8kgf/cm²)

* Pressures in the test-specification table are given in bar (gauge pressure) and/or kgf/cm² (gauge pressure).

Test step	Test specifications*

1.6 Injection valves

E6

Opening pressure

Part No. of injection valve:

0 437 502 007	2.5...3.6 bar (2.6...3.7 kgf/cm²)
0 437 502 015 up to FD 828	2.7...3.8 bar (2.8...3.9 kgf/cm²)
0 437 502 016 from FD 829	3.0...4.1 bar (3.1...4.2 kgf/cm²)

* Pressures in the test-specification table are given in bar (gauge pressure) and/or in kgf/cm² (gauge pressure)

1.7 Fuel distributor

Comparative measurement of fuel deliveries.

Fuel distributor part no. 0 438 100 005 0 438 100 023 0 438 100 059	Setting point	max. allowable delivery
Idle	6.0 cm^3/min.	6.8 cm^3/min.
Part load	40.0 cm^3/min.	44.0 cm^3/min.
Full load	160.0 cm^3/min.*	175.0 cm^3/min.

Fuel distributor part no. 0 438 100 022 0 438 100 079	Setting point	max. allowable delivery
Idle	6.0 cm^3/min.	6.7 cm^3/min.
Part load	40.0 cm^3/min.	43.0 cm^3/min.
Full load	160.0 cm^3/min.*	175.0 cm^3/min.

Fuel distributor part no. 0 438 100 061	Setting point	max. allowable delivery
Idle	6.0 cm^3/min.	6.6 cm^3/min.
Part load	40.0 cm^3/min.	43.0 cm^3/min.
Full load	120.0 cm^3/min.*	131.0 cm^3/min.

Fuel distributor part no. 0 438 100 082 0 438 100 100	Setting point	max. allowable delivery
Idle	6.0 cm^3/min.	6.6 cm^3/min.
Part load	40.0 cm^3/min.	43.0 cm^3/min.
Full load	110.0 cm^3/min.*	120.0 cm^3/min.

* This full-load delivery must be obtained at least with maximum deflection air-flow sensor plate.

Test step	Test specifications

F3

1.8 Idle adjustment*

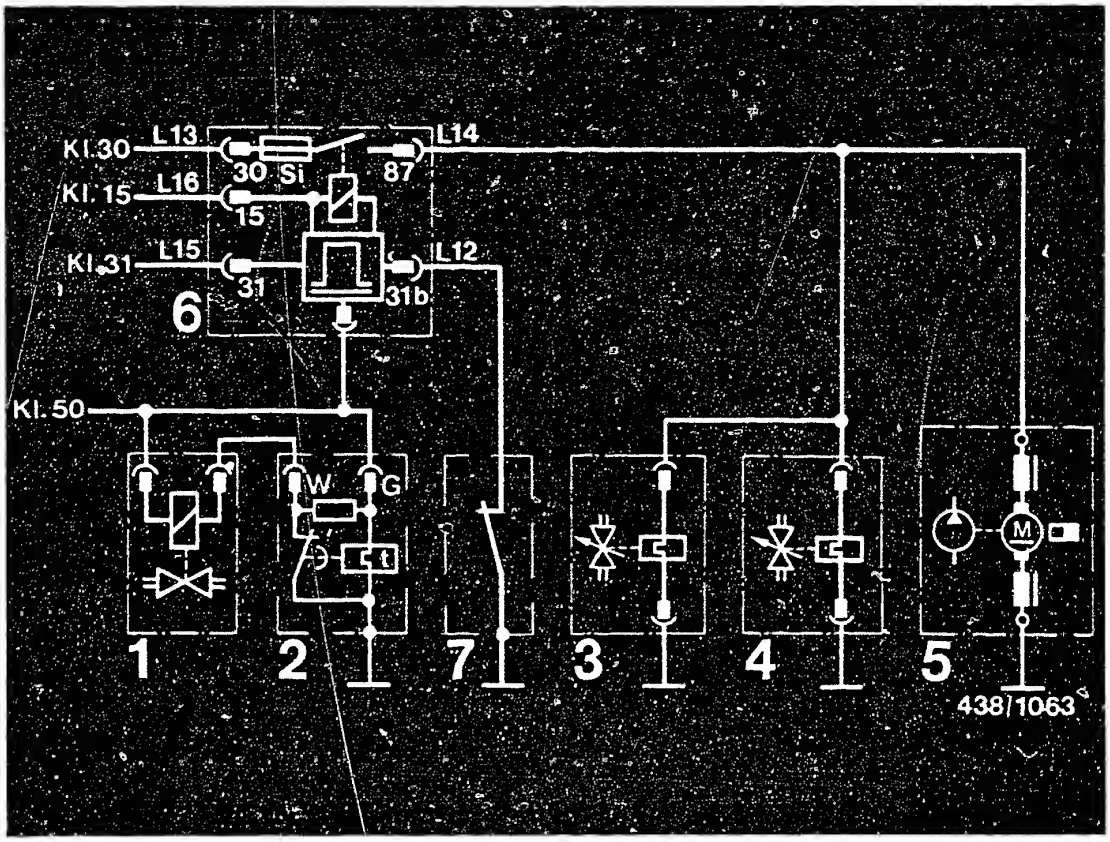
- Idle speed

European versions:	900...1000 min^{-1}
Canada and Sweden versions:	850...1000 min^{-1}

- CO concentration: 1.3...1.7 % by vol. CO

* For adjusting/checking the idle adjustment:

Switch on upper beam. Switch off air conditioner. Engine at normal operating temperature. Radiator fan must not operate during adjustment.
The exhaust-gas recirculation system (only on Canada and Sweden version) must be rendered inoperative.
For adjusting the CO concentration, remove crankcase breather hose from cylinder head cover and seal off.



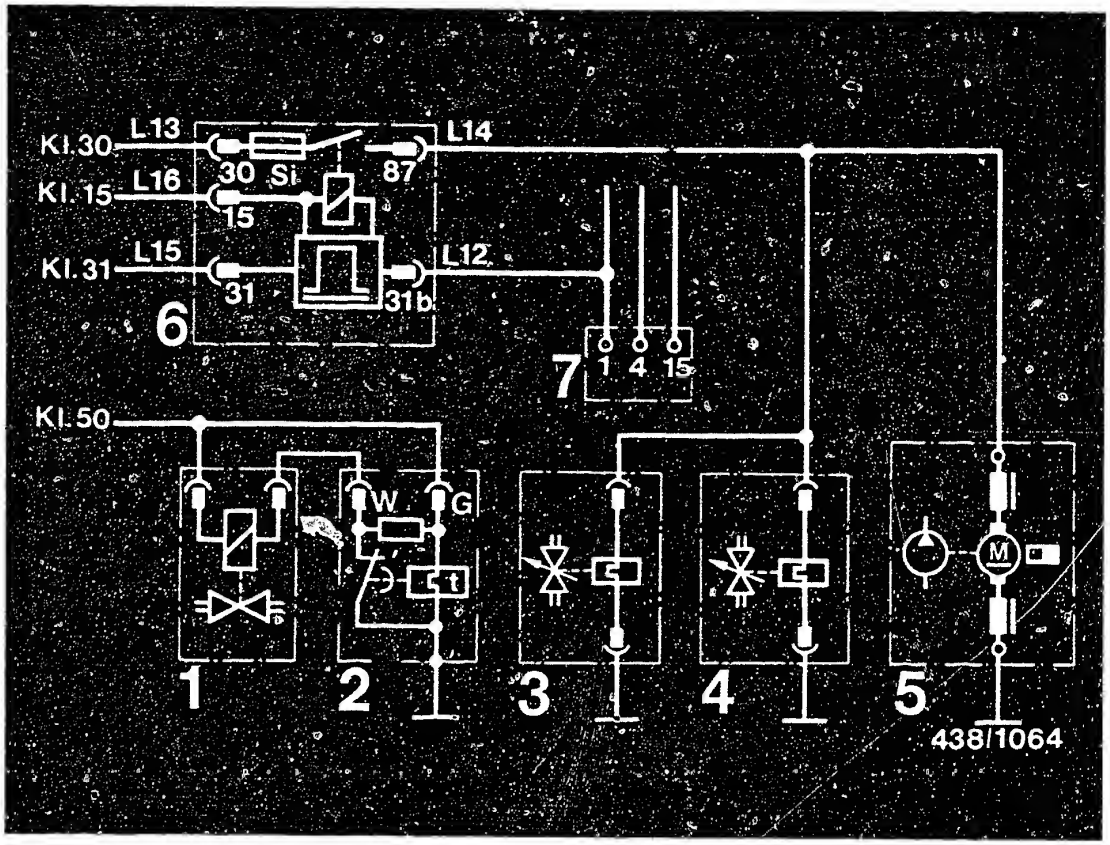
1 = Start valve
2 = Thermo-time switch
3 = Warm-up regulator
4 = Auxiliary-air device
5 = Electric fuel pump
6 = Electronic relay
7 = Air-flow sensor contact

2. Electrical safety circuit

2.1 Circuit diagrams

- 1976 model year, up to chassis no. 846 2042 541

This safety circuit employs an electronic relay with 6 terminals which is energized by the air-flow sensor contact.

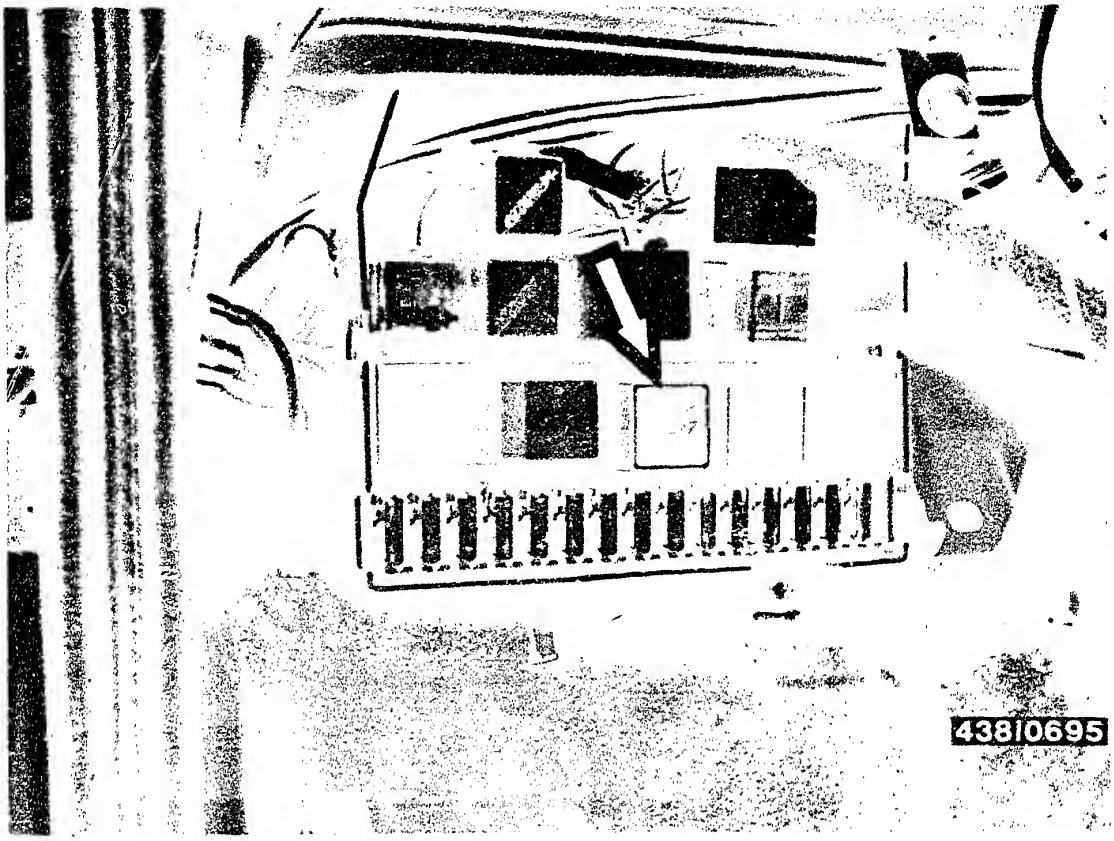


1 = Start valve
2 = Thermo-time switch
3 = Warm-up regulator
4 = Auxiliary-air device
5 = Electric fuel pump
6 = Electronic relay
7 = Ignition coil

- As of 1976 model year, as of chassis no. 846 2042 542

The safety circuit employs an electronic relay with 5 terminals which is energized from terminal 1 of the ignition coil.

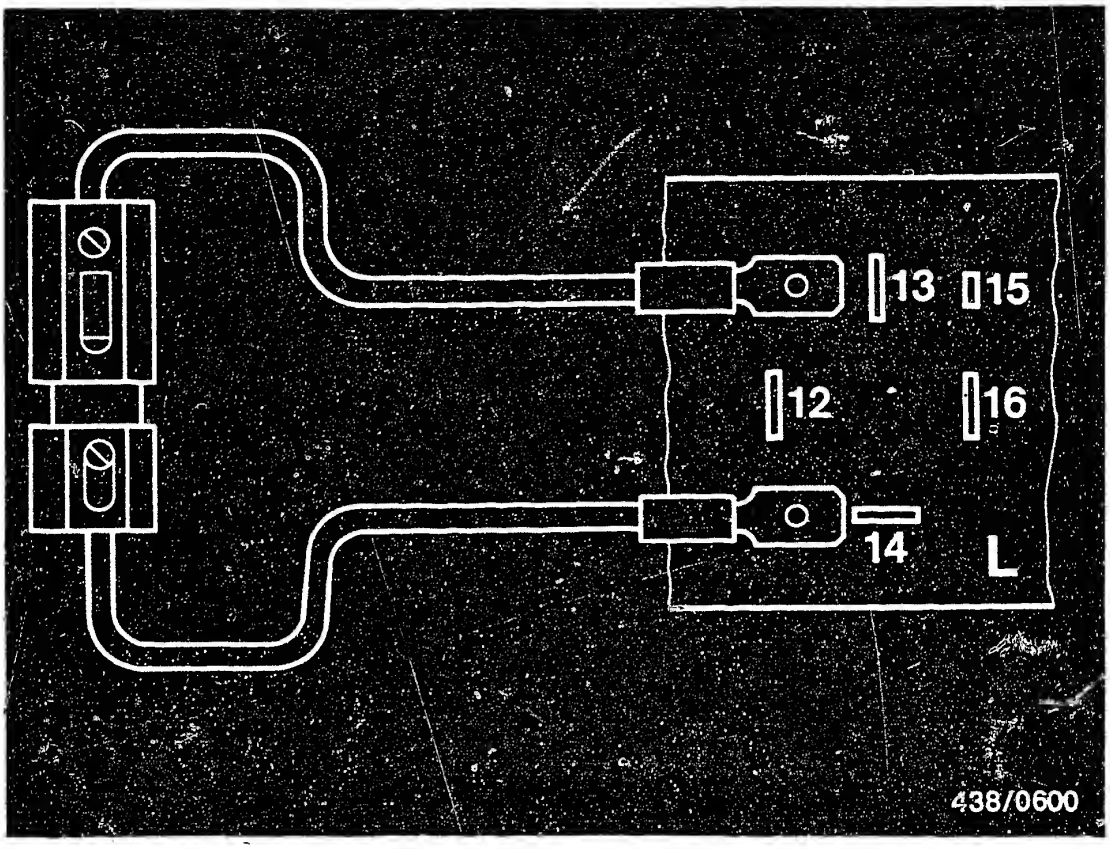
Throughout the entire 1976 model year air-flow sensors with safety contacts were still installed but as of the introduction of the above safety circuit the contacts were no longer connected.



2.2 Bridging the safety circuit

In order to carry out testing with the engine stationary it is necessary to bridge the safety circuit.
To do this pull the electronic relay (arrow), positioned on the left hand side under the instrument panel, out of its base.

Note:
The electronic relay with adapter is mounted at the top on the relay board with a gliding insert.



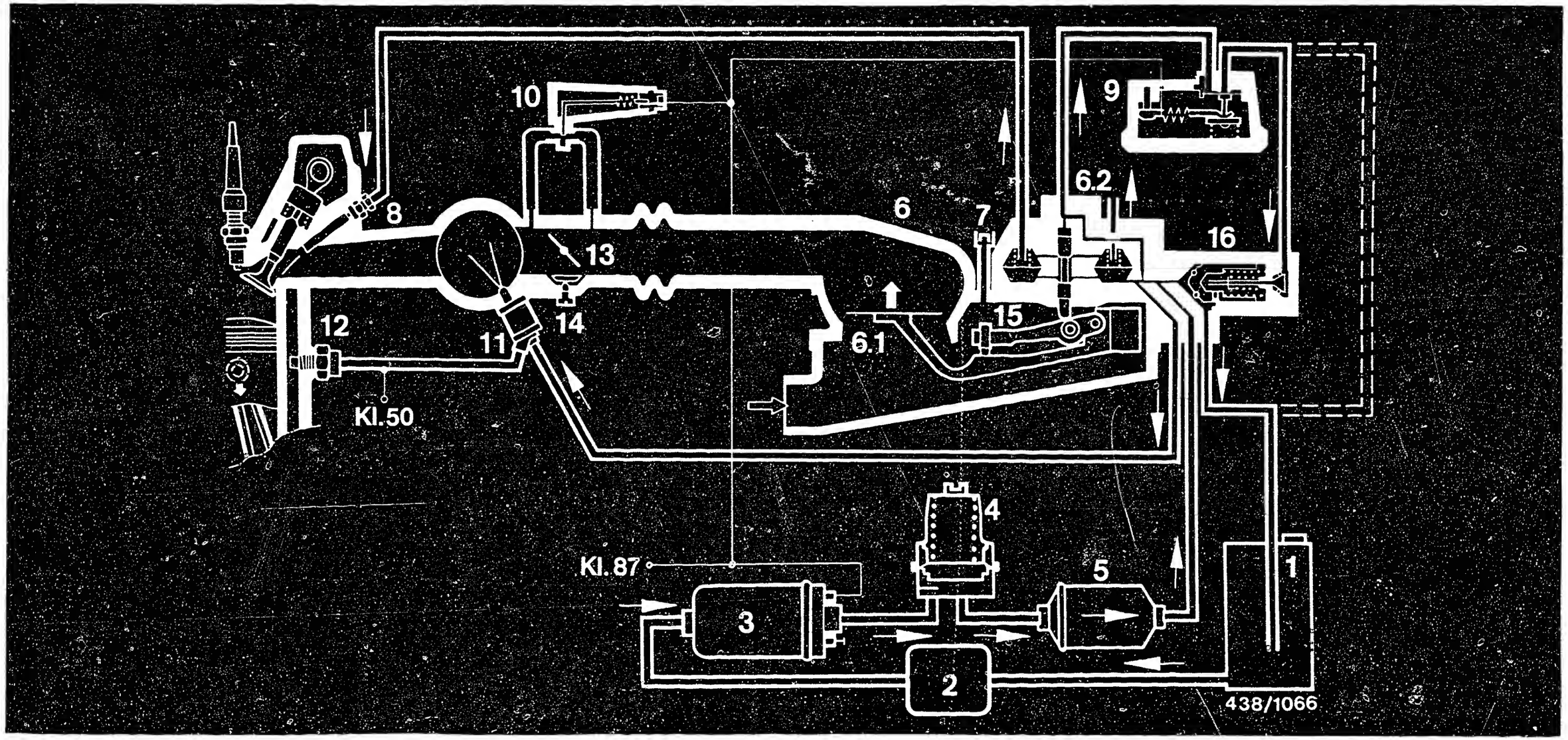
Connect contacts L 13 and L 14 in the base with a bridge.

Use connecting cable 1.5 mm² with fuse holder and 16 A fuse (to be user-fabricated according to sketch).

Electric fuel pump, warm-up regulator and auxiliary-air device are now supplied with battery voltage.

Caution!

Never deflect the air-flow sensor plate with the electric fuel pump operating since otherwise fuel will be injected. Subsequent operation of the starting motor may lead to serious engine damage.



3. Diagram of fuel lines

1 = Fuel tank
2 = Pre-filter
3 = Electric fuel pump
4 = Fuel accumulator
5 = Fuel filter
6 = Mixture-control unit
6.1 = Air-flow sensor
6.2 = Fuel-distributor
7 = Anti-tamper device
8 = Injection valve
9 = Warm-up regulator
10 = Auxiliary-air device
11 = Start valve
12 = Thermo-time switch
13 = Throttle valve
14 = Idle-speed-adjusting screw (bypass)
15 = Idle-mixture-screw
16 = Primary-pressure regulator as of 8.76 with push valve

=== = Warm-up regulator return on vehicles up to 7.76 direct to return line to fuel tank (fuel distributor without push valve).

4. General information

4.1 Introduction

The following vehicle models with longitudinal 1.6 ... 1.8 l/4-cylinder engine are supplied with K-Jetronic:

VW Passat (Dasher) GLI	(7.79 - 5.81)	European version
Audi 80 GTE	(11.75 - 5.77)	
Audi 80 GLE	(6.77)	
Audi Coupé	(9.78)	
Audi 80	(6.77)	Canada and Sweden version
Audi Coupé	(9.78)	

This repair manual refers only to the above-mentioned vehicles and gives a concise description of the testing and adjustment operations to be performed on the vehicle on the K-Jetronic.
All the system components are dealt with in separate working steps with the corresponding test specifications.
In addition to this repair manual the appropriate testing and repair manuals will, of course, be issued for every other vehicle type equipped with the K-Jetronic.
The K-Jetronic differs from other known fuel-injection systems in terms of both construction and operation
In order to be able to carry out the testing procedures described in this manual - and therefore to be able to assess the components - the K-Jetronic and its operation should be clearly understood. The essential points of the operation and construction of the K-Jetronic are described in Technical Instruction VDT-U 3/1 En.

The individual test sections of these repair instructions are detailed and self-contained. Trouble-shooting on a particular item is therefore possible without the whole test program having to be carried out for each fault.
The trouble-shooting chart on Coordinates B1 - B4 should make it easier to ascertain the test sections necessary for particular faults.
According to the symptom detected by you or the customer, select the possible cause in the trouble-shooting chart. The coordinate at the end of the cause column indicates the corresponding test section with the relevant test specifications.

Important note:
If any fuel connections are loosened, parts removed, also on the vacuum system, then new seals must always be used when reconnections are made or when the parts are reassembled.

Utmost cleanliness is essential on all work on the K-Jetronic. All fuel connections should be thoroughly cleaned before they are loosened.

4.2 Design
The entire system of the K-Jetronic in these vehicle models corresponds to the basic design as described in Technical Instruction VDT-U 3/1 En with the exception of the differences listed below.

4.3 The following components are different or extra:

- Up to 7.76 fuel accumulator with 20 cm^3 storage volume, as of 8.76 fuel accumulator with 40 cm^3 storage volume.
- Electric fuel pump with replaceable non-return valve (integrated in tube fitting).
- Prefilter before electric fuel pump.
  Take the possible influence of the prefilter into account when testing the fuel delivery.

- 4-cylinder mixture-control unit with updraft air-flow sensor.
- As of 8.76 fuel distributor with adjustable differential-pressure valves. In this type of fuel distributor, screw plugs are situated adjacent to the fittings for the fuel-injection lines.

This possibility for adjustment has only been introduced for production at the works. This does not result in any additional adjustment possibilities for the After-sales Service Organization. For this reason, the fuel distributor is to be dealt with in precisely the same manner as the conventional model. The screw plugs must not be removed or loosened.

- There is overpressure in the fuel tank. Therefore, before removing the fuel lines, reduce the overpressure by opening the tank filler cap.
- The inlet-union screw on the fuel filter has an integral non-return valve.
  For identification, the hexagonal section is provided with two grooves.
- Electrical safety circuit.

The electric fuel pump, warm-up regulator and auxiliary-air device are energized by an electronic engine-speed relay. Thus, with the engine stopped and the ignition on, this prevents the electric fuel pump from operating and stops the warm-up regulator and auxiliary-air device from shutting off prematurely.

4.4 Other equipment

Vehicles of the Canada and Sweden version are equipped with exhaust-gas recirculation. Some of the exhaust gases are recirculated to the intake system in order to take part once again in combustion.
When performing trouble-shooting and adjustment operations in the vehicle, particularly when performing the idle adjustment, the influence of these additional, possibly defective components should be taken into account.

5. Test equipment and tools

- Pressure tester KDJE-P 100 (previously KDEP 1034).
For testing all fuel pressures and testing for leaks.

- Adjusting wrench KDEP 1035.
For adjusting the idle-mixture-adjusting screw in the mixture-control unit (CO-adjustment).

- Guide ring KDEP 1040/10 (dia. 80 mm)
For centering the air-flow sensor plate in the air-flow sensor.

- Tester for delivered quantity comparison KDJE-P 200. (previously KDJE 7451).
For comparing the fuel delivered from the individual fuel-distributor outlets.

- Graduate (commercially available, capacity approx. 1.5 l)
For measuring the delivery of the electric fuel pump.

- Electric connecting cable (test lead).
KDJE 7450/70 for the direct connection of components to be tested, e.g. cold-start valve.

- Set of tools for the removal and fitting of idle-CO-anti-tamper device of air-flow sensor.
(e.g. No. 4521/7 or Messrs. Hazet,
5630 Remscheid).

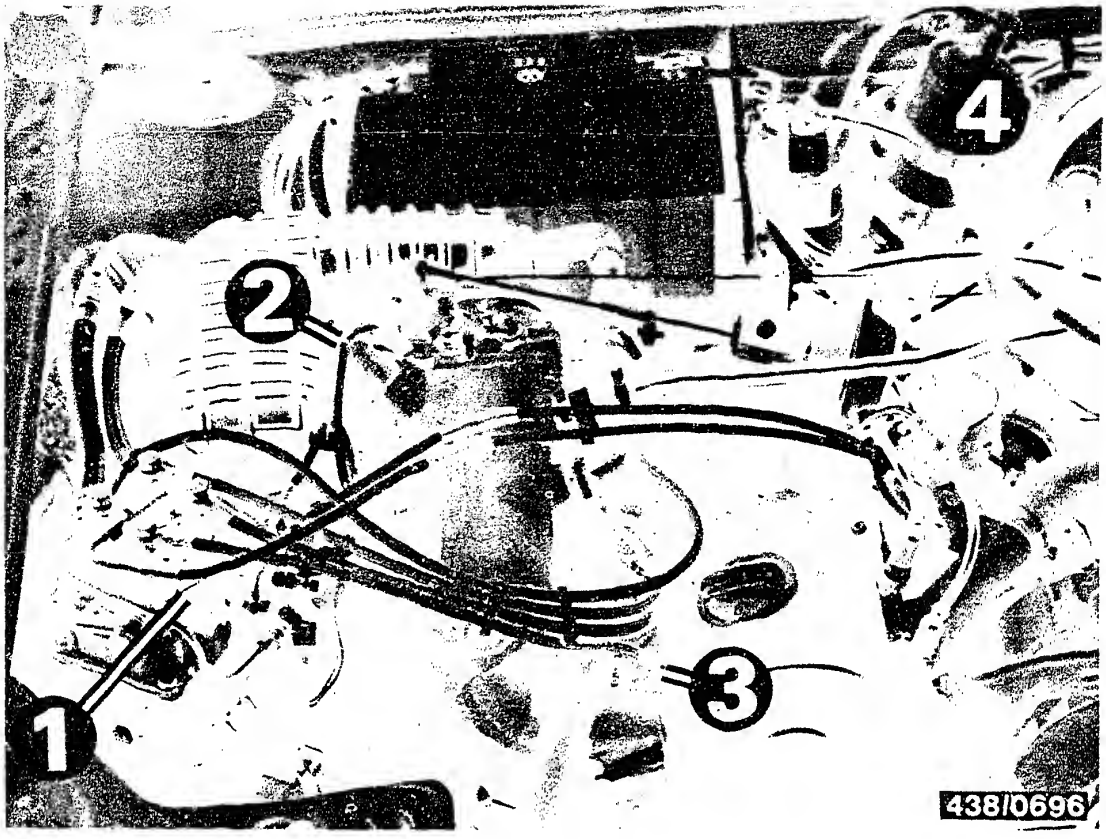
- Valve tester KDJE-P 400 (previously KDJE 7452).
For testing the injection valves.

Test media: Calibrating fluid (Shell K 30, Esso-Varsol, Shell Mineral Spirits 135) or
Bosch, Part Designation VS 14 942-CH
previously Part No. 5973 340 650
The Bosch calibrating fluid can be obtained in 5 l metal cans from the following supplier:
Firma
Oskar Gnamm GmbH & Co
D-7531 Kämpfelbach-Bilfingen

Caution:
For safety reasons, never use normal gasoline or similar easily inflammable and combustible liquids. Even with calibrating fluid, be sure to observe the local official regulations.

- Tachometer (commercially available)
For idle-speed adjustment.

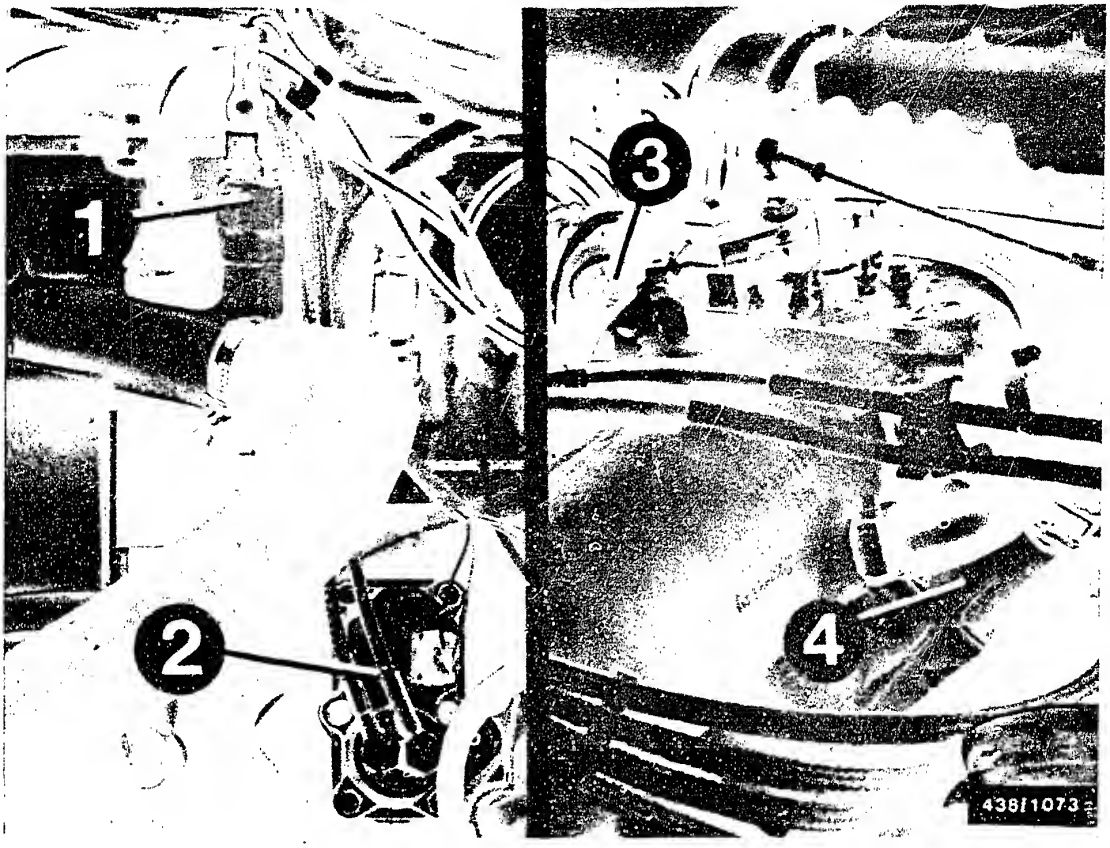
- CO meter (commercially available)
For idle-speed CO adjustment.



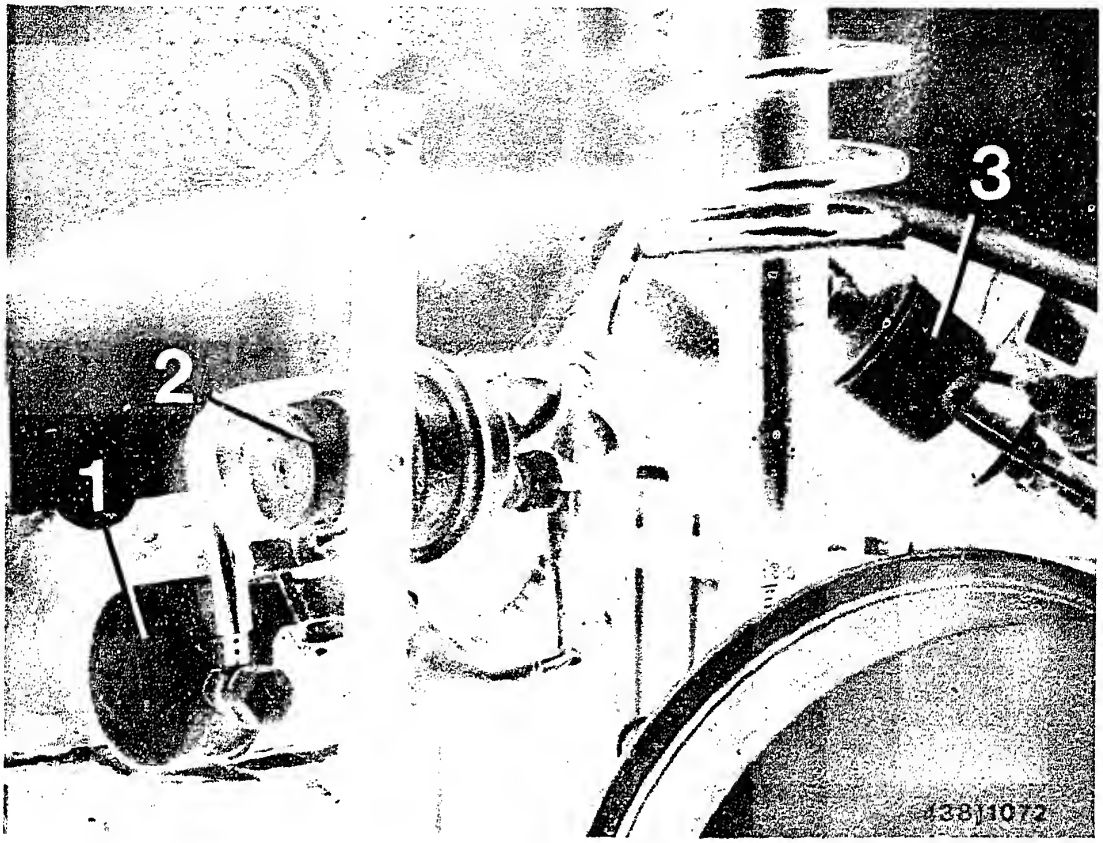
1 = Mixture-control unit
2 = Start valve
3 = Injection valve
4 = Fuel filter

6. Installation position of individual components

6.1 Arrangement of components on the engine



1 = Thermo-time switch
2 = Warm-up regulator
3 = Cold-start valve
4 = Auxiliary-air valve



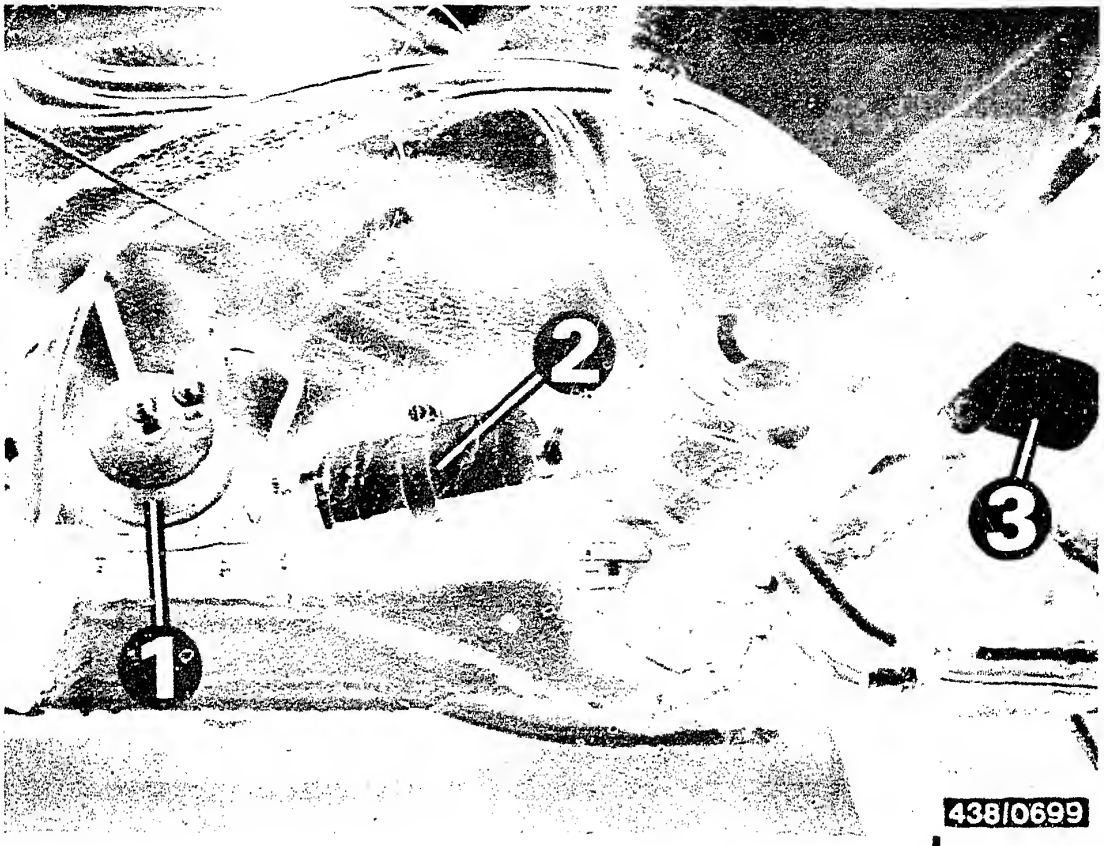
1 = Electric fuel pump
2 = Fuel accumulator
3 = Fuel filter

6.2 Fuel-supply components

- Vehicles up to 7.1976

The electric fuel pump and fuel accumulator are mounted on a common bracket above the rear axle.

The fuel filter is mounted directly on the floor of the vehicle above the rear axle.



1 = Fuel accumulator
2 = Electric fuel pump
3 = Prefilter

• Vehicles as of 8.1976
The fuel accumulator and electric fuel pump are mounted on a common bracket in front of the rear axle.

There is a prefilter in the intake line to the electric fuel pump.

Clean the connections thoroughly before replacing any of these components.
Before loosening the connections pinch off the intake hose to the electric fuel pump so that no fuel can escape (e.g. using hose clamper W 157 from Matra Co.).

7. Trouble-shooting chart

When trouble-shooting the K-Jetronic, it is assumed that the ignition is in order and that the engine is in proper mechanical condition.

The individual test steps of this repair manual are detailed and self-contained. This permits direct trouble-shooting without having to go through the entire test program for each fault.

The trouble-shooting chart on Coordinates B 2 - B 5 is intended to make it easier to decide which test steps have to be carried out for certain faults.

According to the symptom stated by the customer or which you yourself have determined, select the possible cause in the trouble-shooting chart. The coordinates at the end of the cause column refer to the appropriate test step with the associated test specifications.

7. Trouble-shooting chart

Customer complaint (fault symptom)

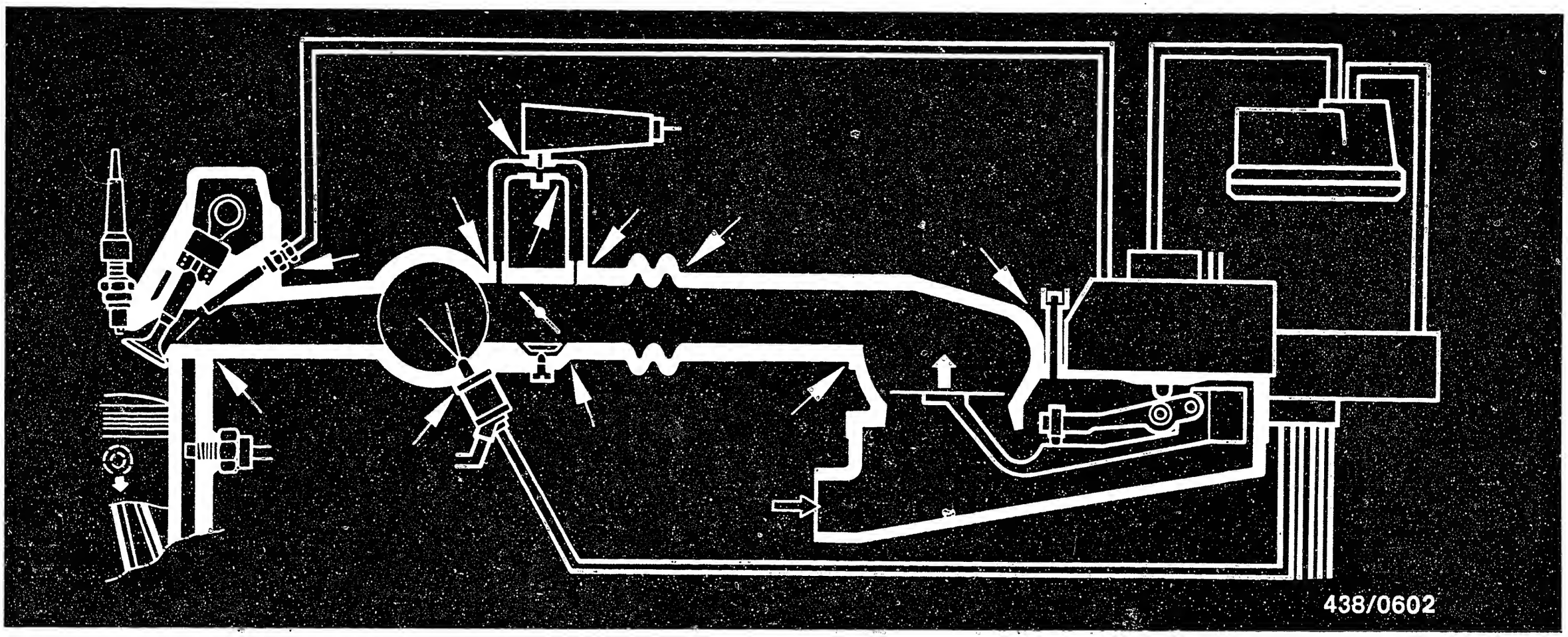
1. Engine does not start, or starts poorly, in cold condition
2. Engine does not start, or starts poorly, in warm condition*
3. Irregular idling during the warm-up phase (shakes)
4. Irregular idling with warm engine (shakes)
5. Engine does not draw gas, burbles
6. Engine misfires when operating on the road, high load
7. Insufficient power

*Note
If, in the case of Sympton 2, after checking and repairing all the fault causes listed below, the hot-start characteristic is still unsatisfactory this can be improved by fitting an impulse relay.
The fitting of this relay is described in Coordinate L 14.

1	2	3	4	5	6	7	Cause	Coordinate
	●	●	●	●		●	Vacuum system leaking	B 6
●	●		●	●	●	●	Air-flow sensor lever and/or control plunger not moving smoothly	B 8
	●						Position of the air-flow sensor plate incorrect	B 18
●		●					Auxiliary-air device does not open	B 23
●	●				●		Electric fuel pump not operating	C 1
●							Cold-start system defective	C 5
		●	●				Cold-start valve leaking	C 5
				●			Excessive fuel quantity for control-pressure circuit	C 11
●		●					"Cold" control pressure outside tolerance	C 9
	●		●	●	●	●	"Warm" control pressure too high (after warm-up)	C 9
			●	●		●	"Warm" control pressure too low (after warm-up)	C 9
					●	●	Primary (system) pressure outside tolerance	D 1
	●						Overall fuel system leaking	D 10
●	●	●	●		●		Injection valves leaking, opening pressure too low	E 6
●	●	●	●			●	Unequal fuel delivery (imbalance of fuel delivery)	G 15
●	●	●	●	●			Basic idle adjustment incorrect	F 3
						●	Throttle plate does not open completely	|-----

Customer complaint (fault symptom) - (continued)

8. Engine runs on after being switched off ("diesels")	9. Fuel consumption too high	10. Flat spot during acceleration	11. CO concentration during idling too high	12. CO concentration during idling too low	13. Idle-speed cannot be adjusted (too high)	14. Engine starts but then immediately stops	Cause	Coordinate
	●	●	●	●		●	Vacuum system leaking	B 6
●	●		●	●	●	●	Air-flow sensor lever and/or control plunger not moving smoothly	B 8
	●						Position of the air-flow sensor plate incorrect	B 18
●		●					Auxiliary-air device does not open	B 23
●	●				●		Auxiliary-air device does not close	C 1
●							Electric fuel pump not operating	C 5
		●	●				Cold-start system defective	C 5
				●			Cold-start valve leaking	C 11
●		●					Excessive fuel delivery for control-pressure circuit	C 9
	●		●	●	●	●	"Warm" control pressure too high (after warm-up)	C 9
			●	●		●	"Warm" control pressure too low (after warm-up)	C 9
					●	●	Primary (system) pressure outside tolerance	D 1
	●						Overall fuel system leaking	D 10
●	●	●	●		●		Injection valves leaking, opening pressure too low	E 6
●	●	●	●			●	Unequal fuel delivery (imbalance of fuel delivery)	E 15
●	●	●	●	●			Basic idle adjustment incorrect	F 3
						●	Throttle plate does not open completely	---



Working steps

8. Check the air-intake system of the engine for leaks.

The arrows in the diagram show typical points where leaks can occur. Check by performing a visual inspection or, in cases of doubt, as follows: Disconnect the hose from the outlet of the auxiliary-air device and blow air through this hose into the intake system using a compressed-air gun. The throttle valve is to be fully open. Brush connection points with soapy water, or spray with leak detector (e.g. Güpoflex).
Under no circumstances may combustible liquids be used when testing for leaks.

The formation of bubbles or foam indicates a leak.
When testing for leaks, pay particular attention to O-rings and insulating sleeves of injection valves. If necessary, tighten with Allen wrench (AF = 12 mm).
If a leak has been eliminated, it is necessary finally to carry out the idle adjustment with the engine at normal operating temperature.
Idle adjustment is described on Coordinate F3.

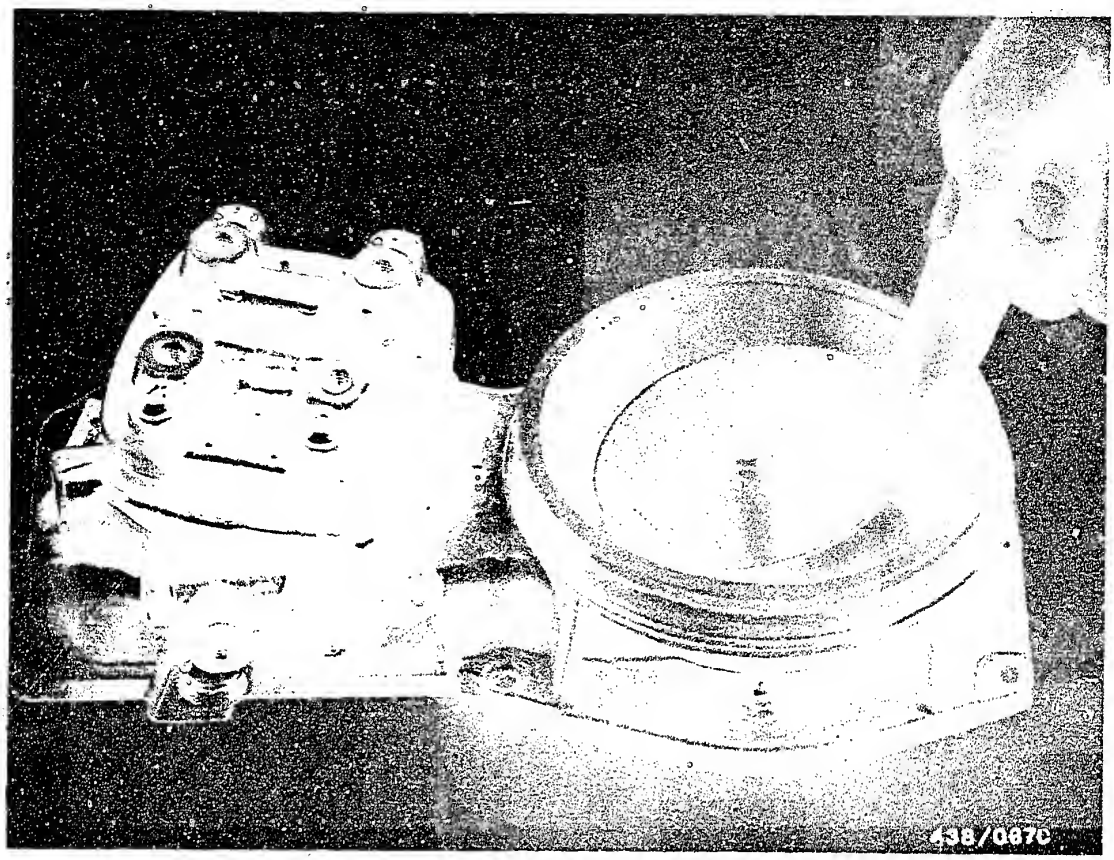
9. Check the control lever in the air-flow sensor and the control plunger in the fuel distributor for ease of movement.

9.1 Preparations

- Engine temperature not below +20°C.
- Remove the rubber hood (loosen 2 clamping bands) so that the air-flow sensor plate becomes accessible.
- Switch on the electric fuel pump for approx. 10 seconds by bridging the safety circuit.
  This results in application of the control pressure to the control plunger in the fuel distributor.

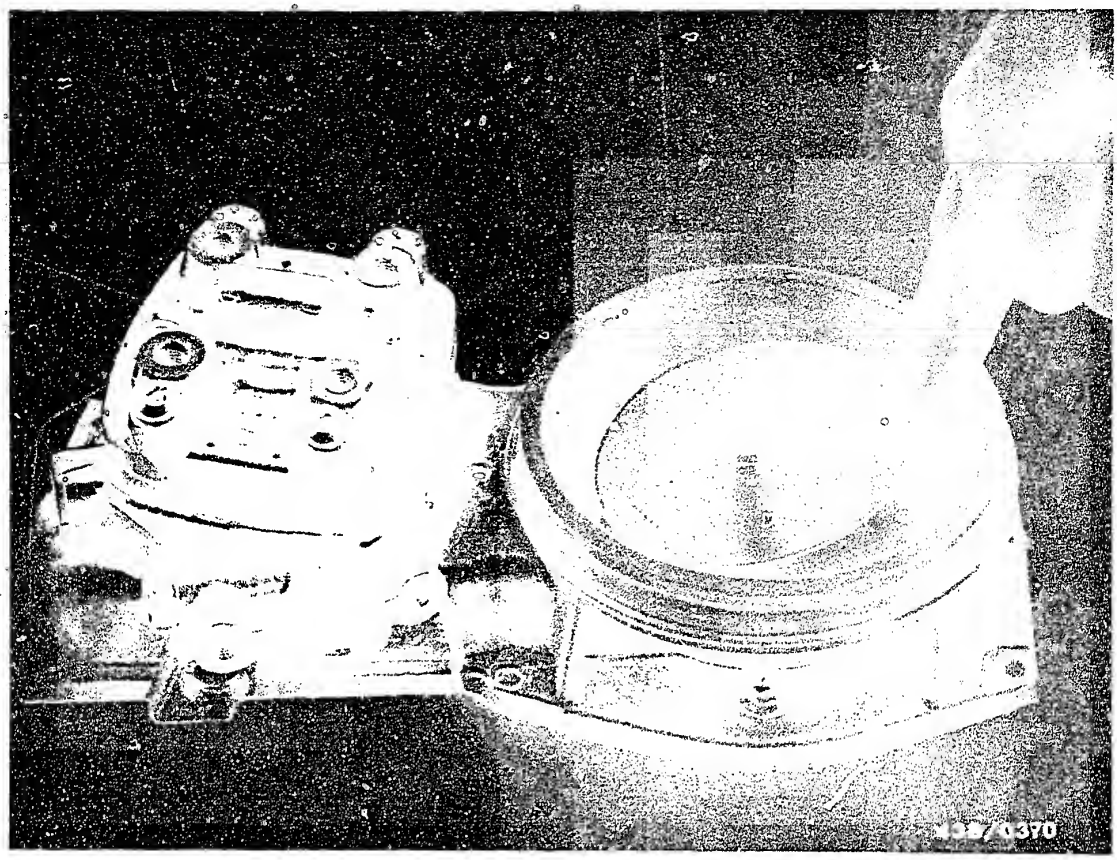
Caution!

Never deflect the air-flow sensor plate with the electric fuel pump operating since otherwise fuel will be injected. Subsequent operation of the starting motor may lead to serious engine damage.



9.2 Check that the control lever moves freely

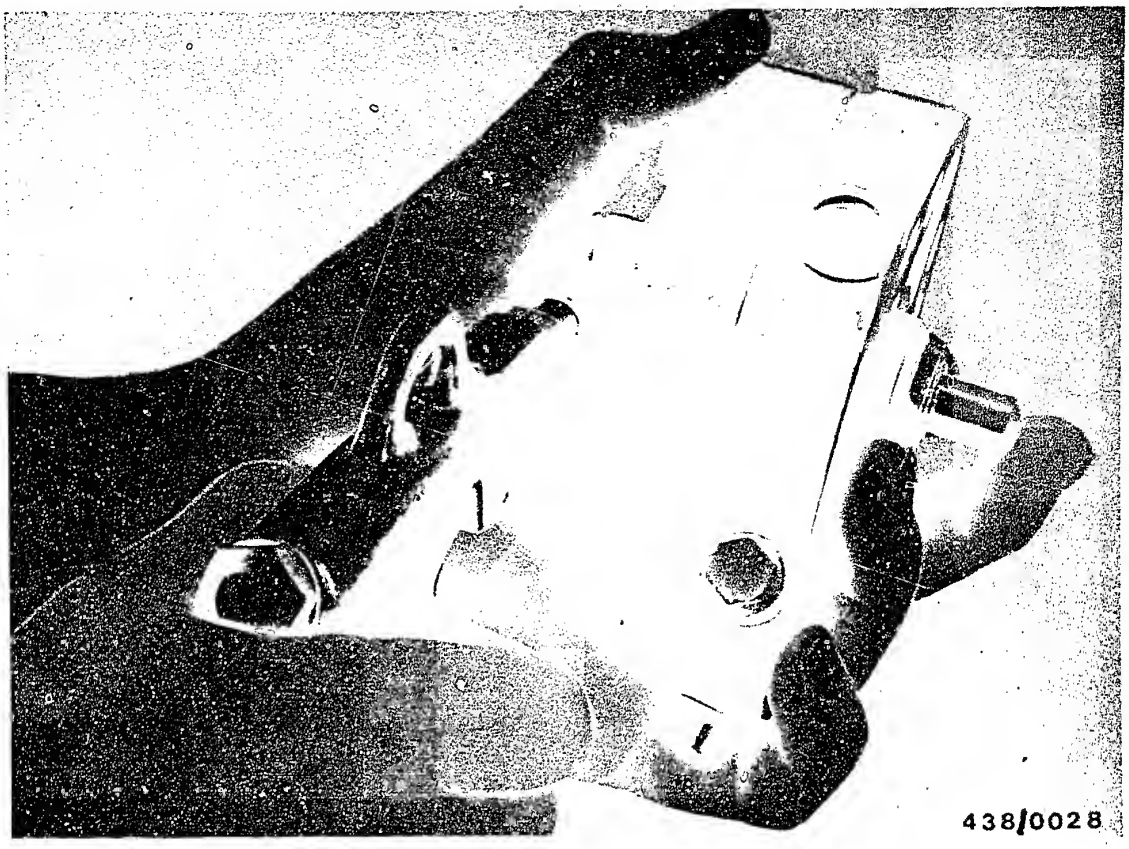
Raise the air-flow sensor plate by hand (updraft) and release again.
The sensor plate snaps back into the zero position and bounces up about twice from the spring-loaded stop.
If the control lever does not move freely, first release all fastening screws holding the air-flow sensor to determine whether housing deformation is the cause of the problem.
If the problem is solved by loosening the fastening screws, the seal between the air-supply housing and air-flow sensor should be changed (Peugeot parts).
Tighten the screws uniformly cross-wise to a torque of 9...10 Nm (0.9...1.0 kgfm).
If the housing is not deformed, then the air-flow sensor must be repaired or replaced.



9.3 Check that the control plunger moves freely.

Raise the air-flow sensor plate by hand (updraft). The same resistance must be felt over the entire movement. Move the sensor plate rapidly back to a position just in front of the zero stop. The control plunger follows only sluggishly, but must make noticeable contact with the sensor plate lever. If this condition is fulfilled, the control plunger can be considered to move freely. If the control plunger does not move freely, remove the fuel distributor from the air-flow sensor.

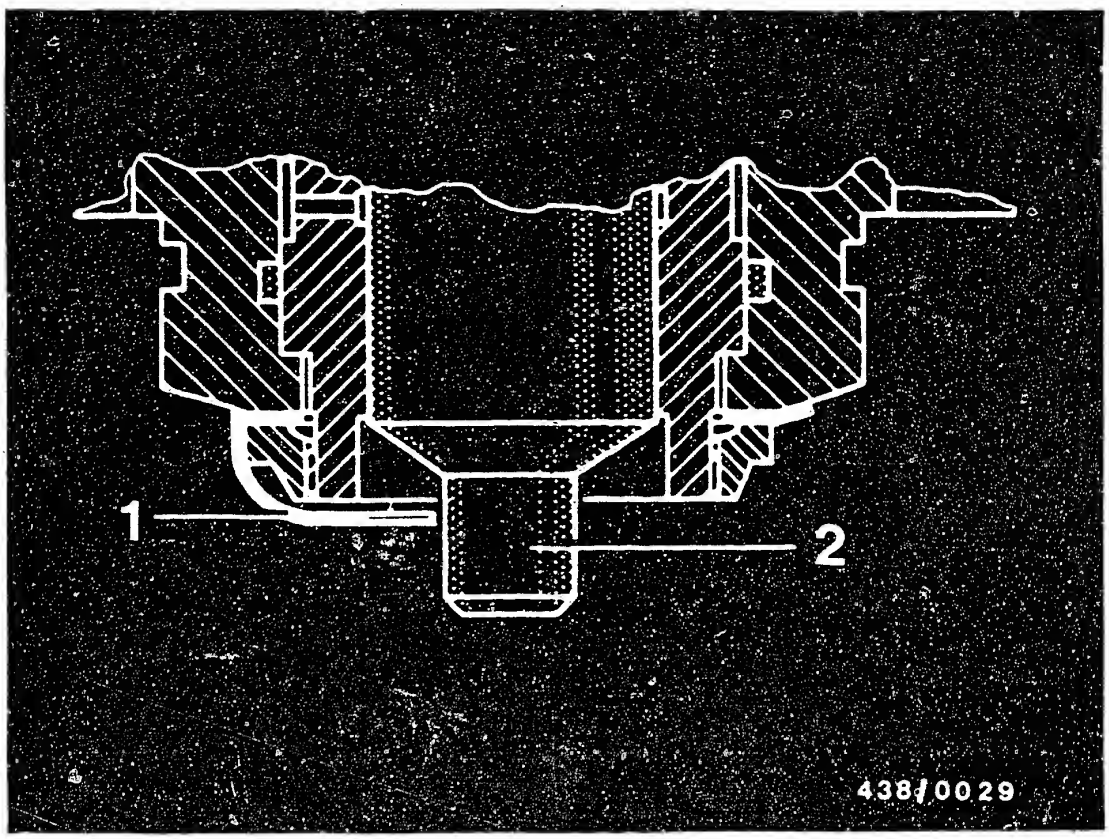
Important!
Note the following when installing fuel components and fuel lines:
Always ensure utmost cleanliness when loosening or tightening the fuel connections. No dirt must enter the fuel system.
When loosening or tightening the fuel connections, apply counter-force at the fixed hexagon of the component.
Clean the fuel distributor thoroughly in the region of the fuel connections. Screw off all connections.



Unscrew the three fastening screws and remove the fuel distributor from the air-flow sensor.
Remove the plunger. Under certain conditions, in order to do this it may be necessary to blow compressed air briefly against the plunger through the control-pressure connection hole. Hold the plunger with your hand while doing this. Clean the plunger thoroughly with benzine. If the plunger still does not move freely, replace the fuel distributor.

Caution!

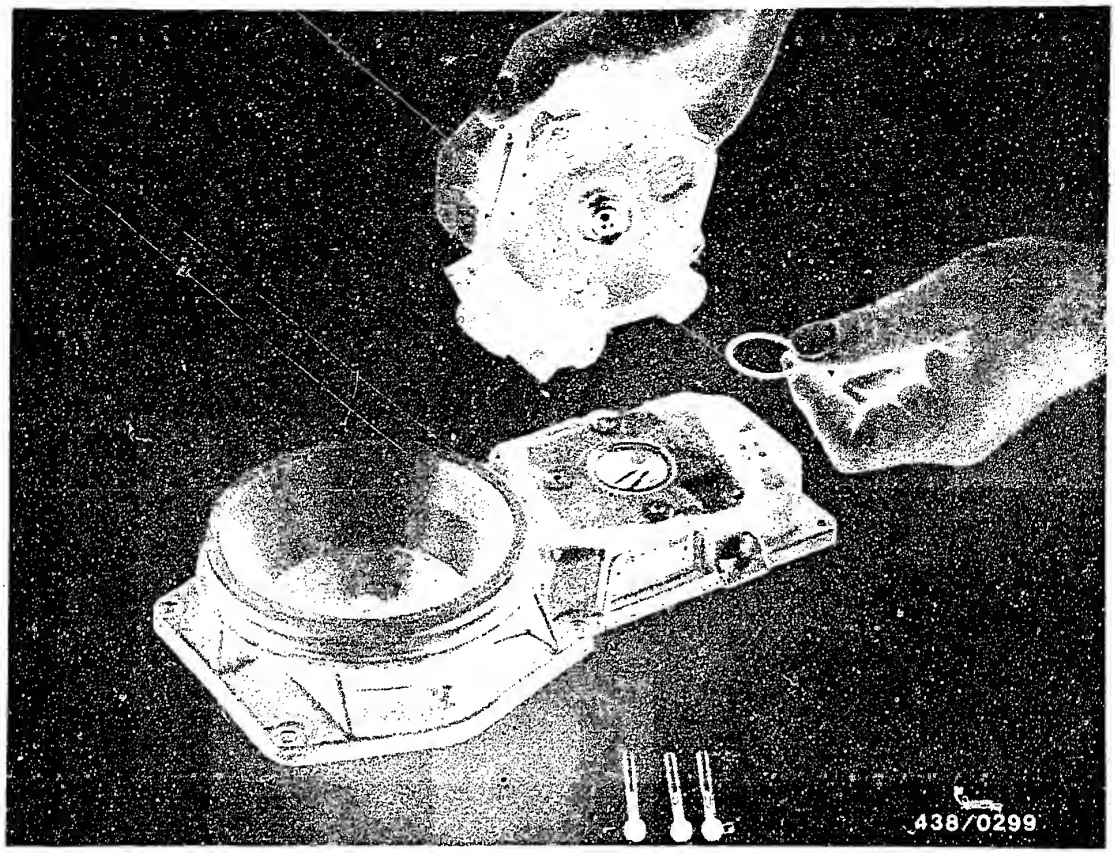
Some fuel distributors are equipped with a compression spring above the control plunger and a drop-out safeguard.
When removing the control plunger, first of all bend up the drop-out safeguard, pay attention to the compression spring and re-install the spring when reassembling.



1 = Anti-drop-out device
2 = Control plunger

9.4 Fuel distributor with anti-drop-out device for the control plunger

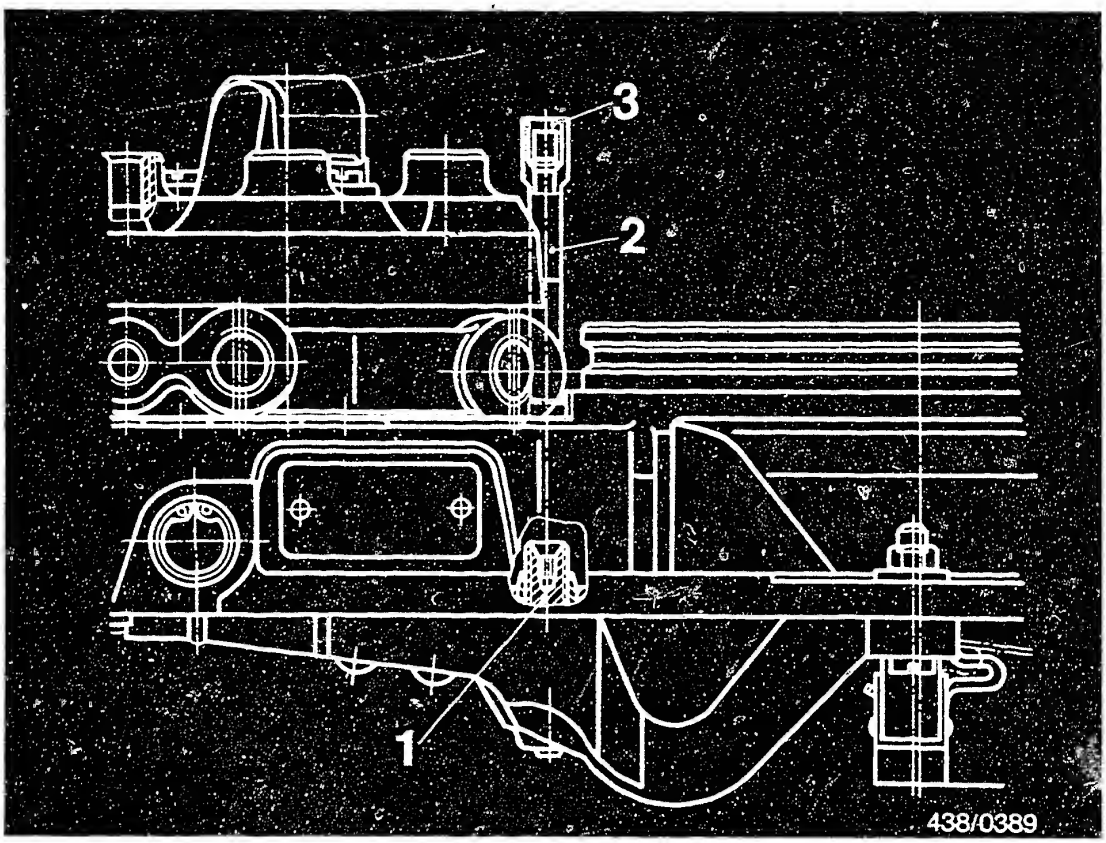
Caution!
As from the date of manufacture FD 724 (4.1977) the fuel distributors 0 438 100 011 and 012 have an anti-drop-out device for the control plunger.
This also protects the plunger in transit and facilitates installation.
The anti-drop-out device must not be removed!



9.5 Fitting the fuel distributor

When fitting the fuel distributor, use a new seal ring between fuel distributor and air-flow sensor. Observe the tightening torque 3.2...3.8 Nm (0.32... 0.38 kgfm) for the fastening screws precisely.

When connecting the fuel-injection tubing, use new seal rings.

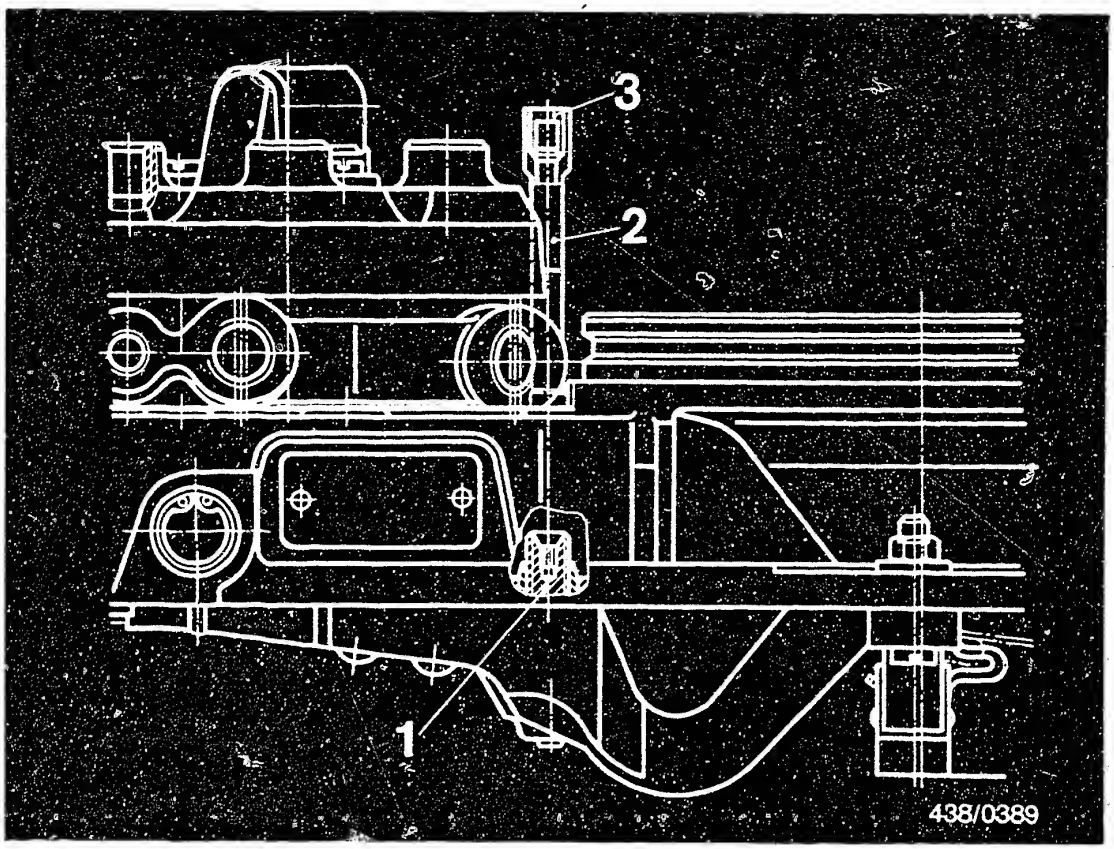


1 = Idle-mixture-adjusting screw
2 = Guide tube
3 = anti-tamper device

9.6 Matching the fuel distributor to the air-flow sensor for initial starting

Screw off one fuel-injection line from the fuel distributor.
Bridge the electrical safety circuit so that the electric fuel pump operates.

The idle-mixture-adjusting screw is adjusted via a guide tube rigidly fitted on the mixture-control unit.

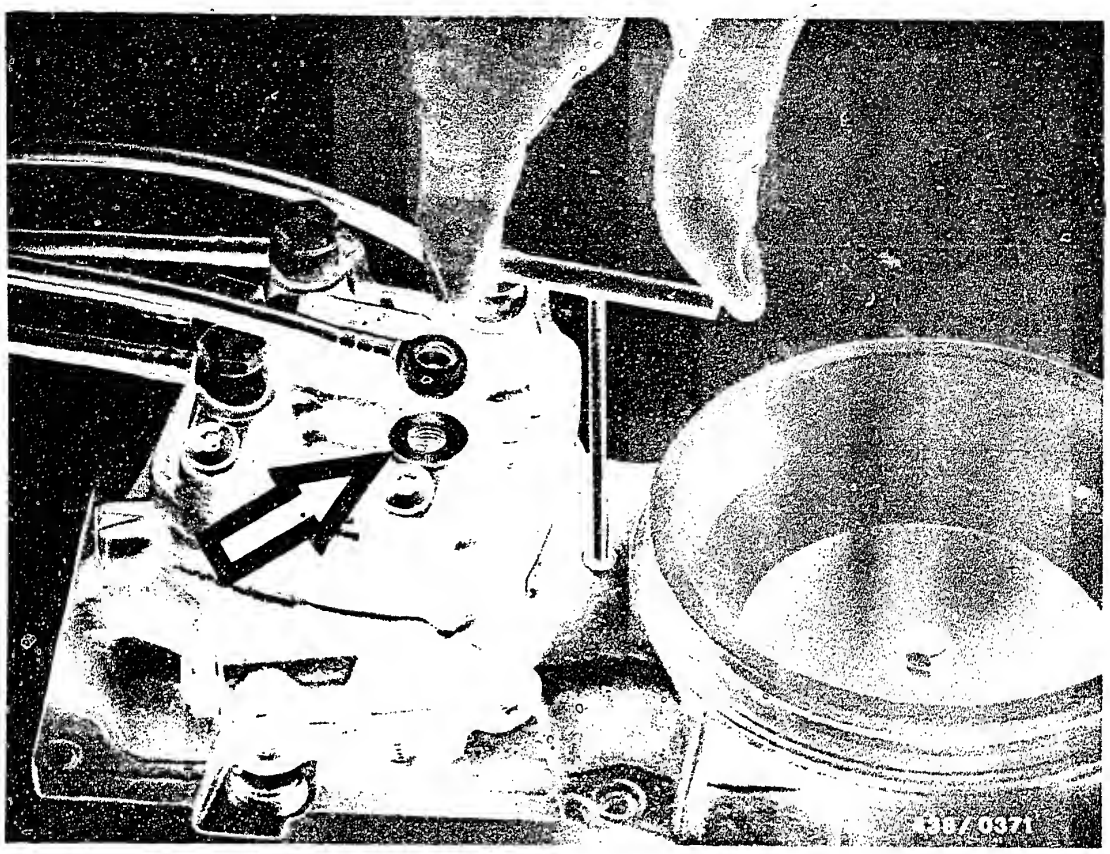


1 = Idle-mixture-adjusting screw
2 = Guide tube
3 = Anti-tamper cap

Remove anti-tamper device of the idle-mixture - adjusting screw. Introduce adjusting wrench KDEP 1035 through the hole into the idle-mixture-adjusting screw.

CAUTION!

Never deflect the air-flow sensor plate with the electric fuel pump operating since otherwise fuel will be injected. Subsequent operation of the starting motor may lead to serious engine damage.



Screw in the idle-mixture-adjusting screw slowly and without exerting any great pressure on the adjusting wrench until fuel is just delivered from the open outlet (arrow) of the fuel distributor. Then turn back the adjusting screw by 1/2 turn.

Re-connect the fuel-injection line to the fuel distributor, start the engine and warm up.

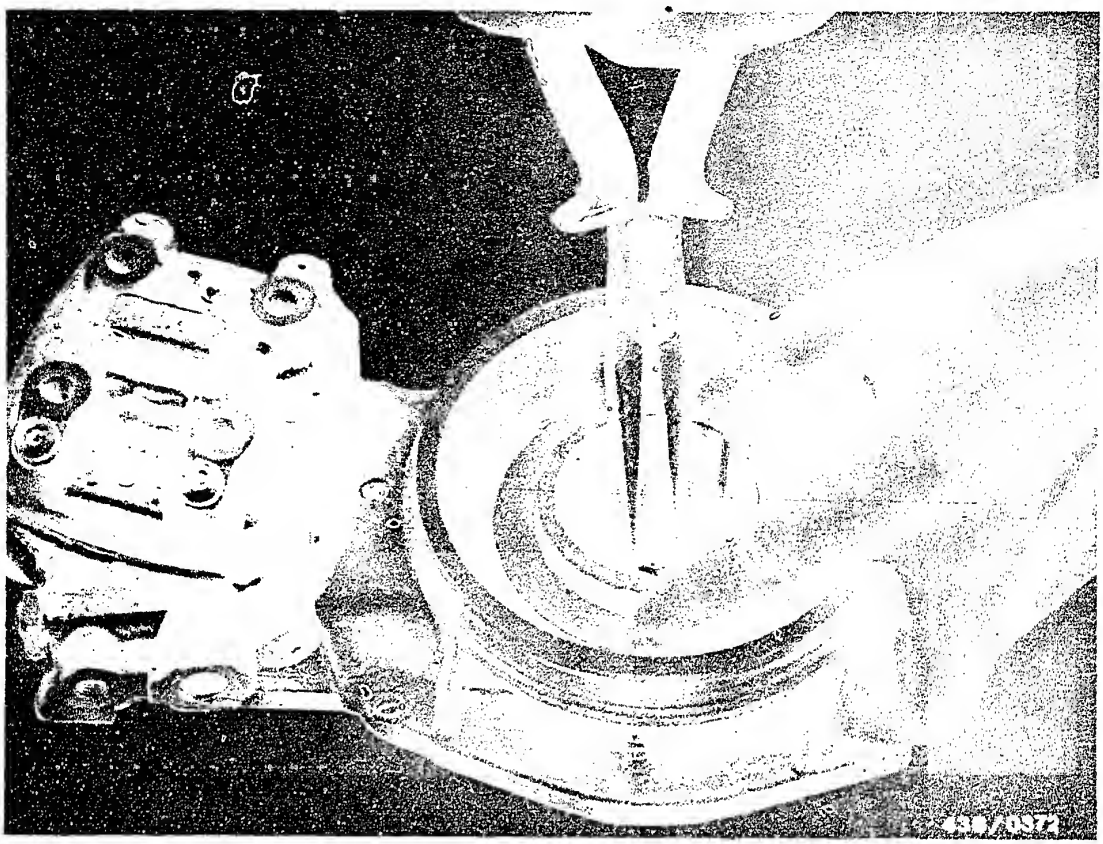
The final matching of air-flow sensor and fuel distributor is carried out by adjusting the idle speed with the engine at normal operating temperature.

Idle-speed adjustment is described on Coordinates F3

10. Testing and adjusting the position of the air-flow sensor plate

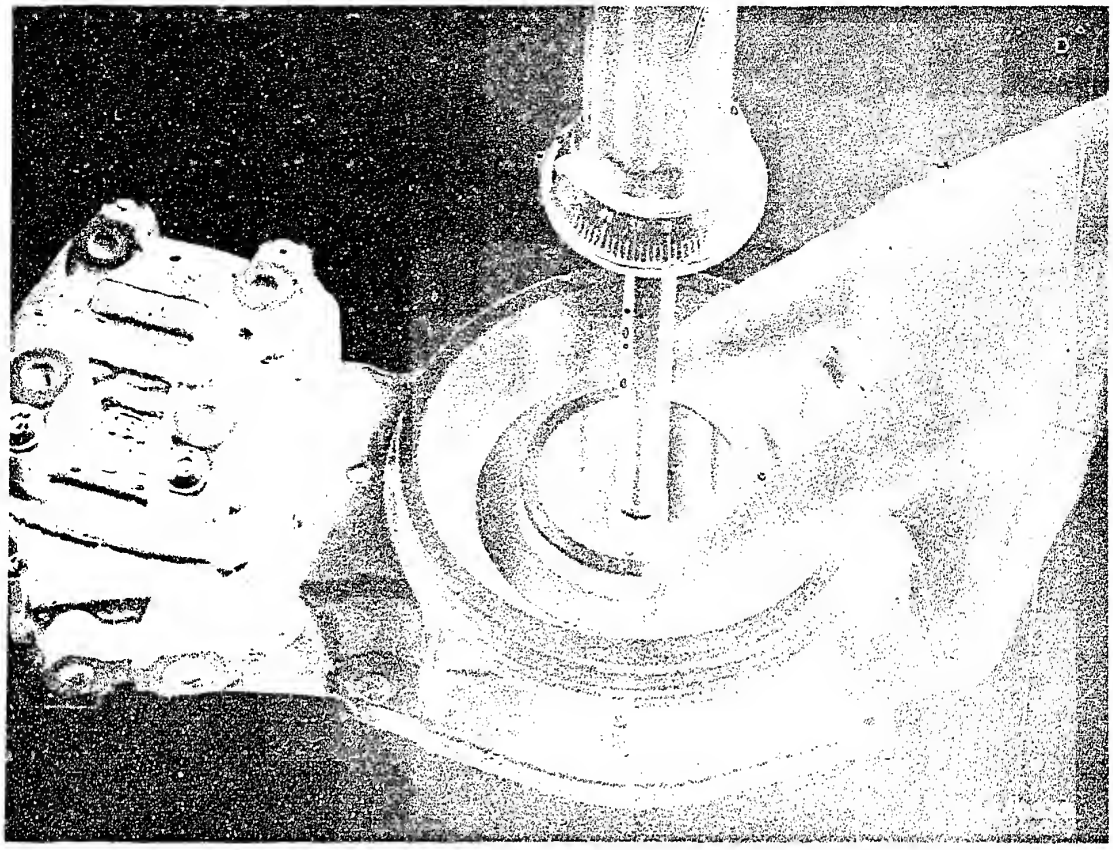
10.1 Preparations

- The temperature of the engine is not important.
- Remove the rubber dome between air-flow sensor and throttle-valve assembly (loosen two clamping bands) so that the air-flow sensor plate is accessible.

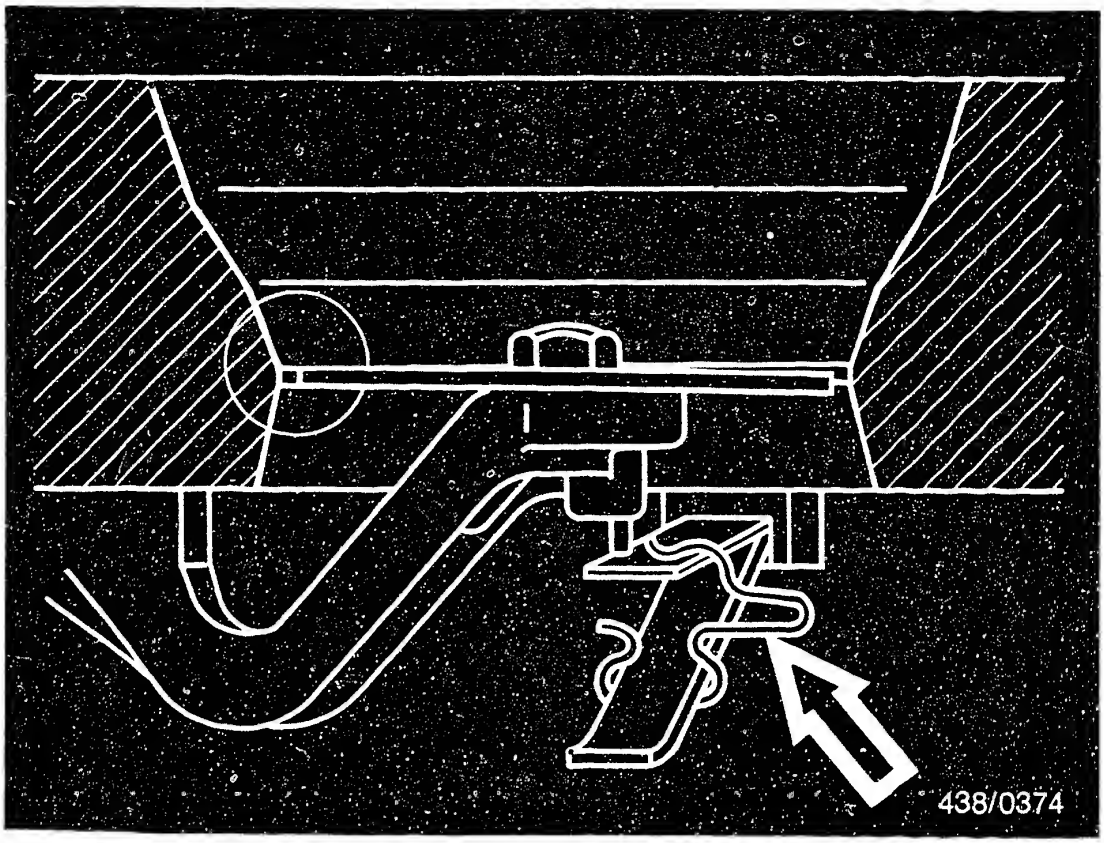


10.2 Centering the air-flow sensor plate

Check that the sensor plate is flat (not bent) and that it can move through the narrowest part of the air funnel without touching the funnel. If necessary, center it using a positioning ring KDEP 1040/10 (dia. 80 mm) as follows:
Loosen the sensor plate fastening screw. Insert the positioning ring while holding the fastening screws with pliers so that the sensor plate does not deflect downwards.



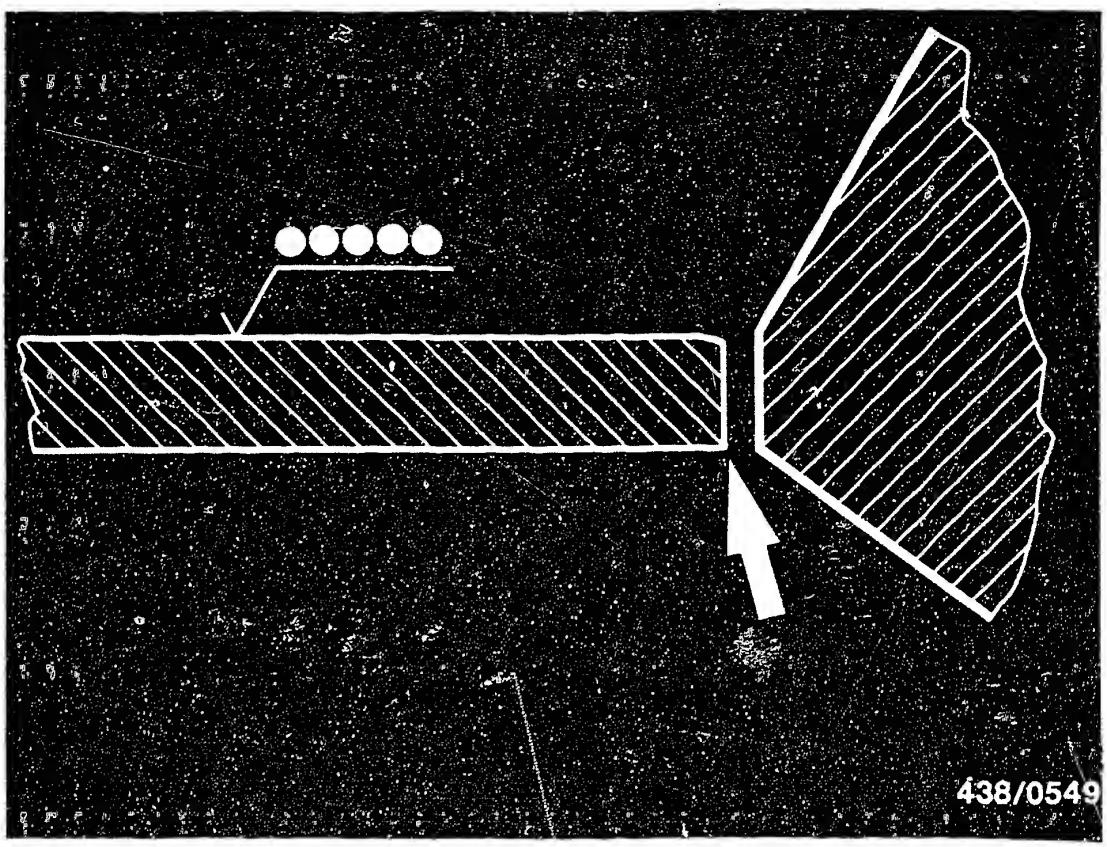
With the positioning ring in place, tighten the fastening screw with a torque of 5.0...5.5 Nm, loosen again and tighten again with the same torque.
When tightening the screw make sure that the air-flow sensor plate is in its zero position (in the cylindrical part of the air funnel).
It must no longer be possible to turn the air-flow sensor plate by hand.



10.3 Checking and adjusting the zero position of the sensor plate (rest position):

Switch on the electric fuel pump for approx. 10 seconds by bridging the safety circuit.
This results in application of the control pressure to the control plunger in the fuel distributor.

The upper edge of the sensor plate must be flush with the beginning of the cone in the position shown in the picture. A lower position of up to maximum 0.5 mm is permissible, however the air-flow sensor plate must not project at any point on its circumference outside the cylindrical part of the air funnel.
If necessary, the position of the air-flow sensor plate can be corrected by adjusting the shaped spring (arrow).

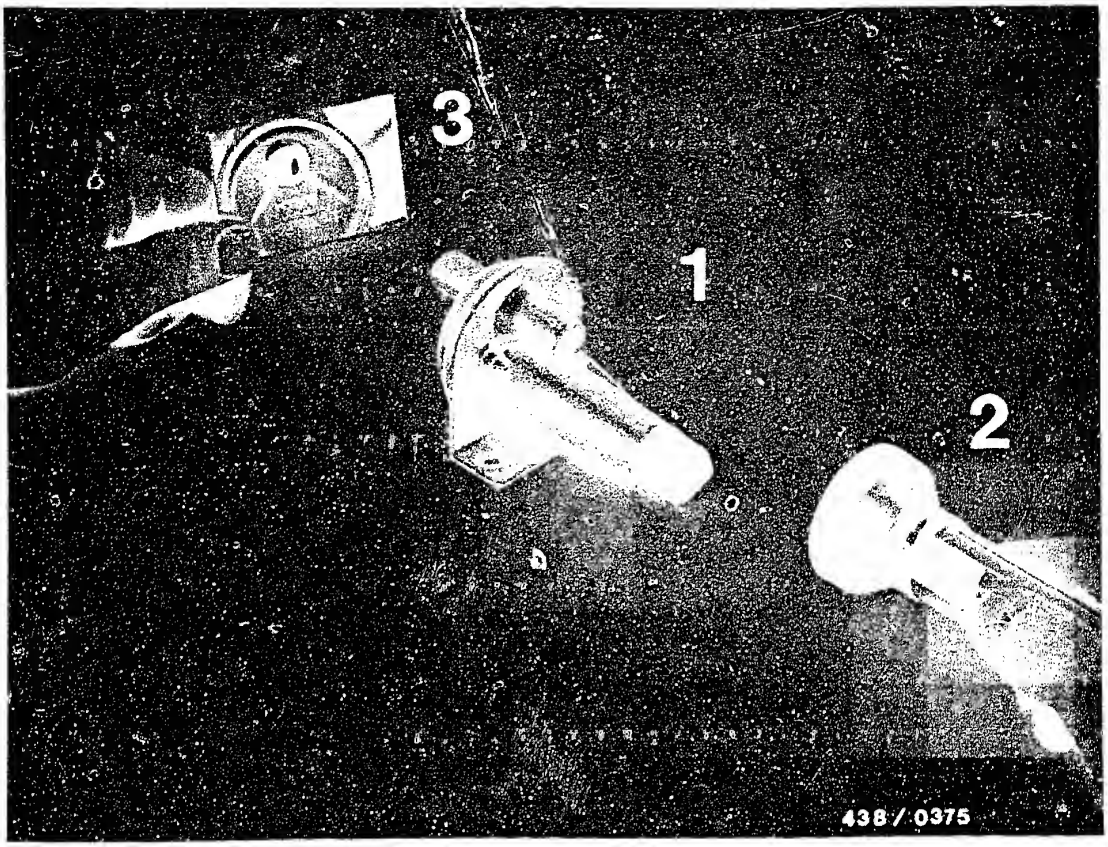


Caution:

Be sure that sensor plate is mounted in correct position.

The upper side of the air-flow sensor plate is identified by five punch marks (in a row).

The sharp edge (arrow) of the sensor plate is at the bottom.



1 = Auxiliary-air device
2 = Flashlight
3 = Mirror

11. Checking the operation of the auxiliary-air device.

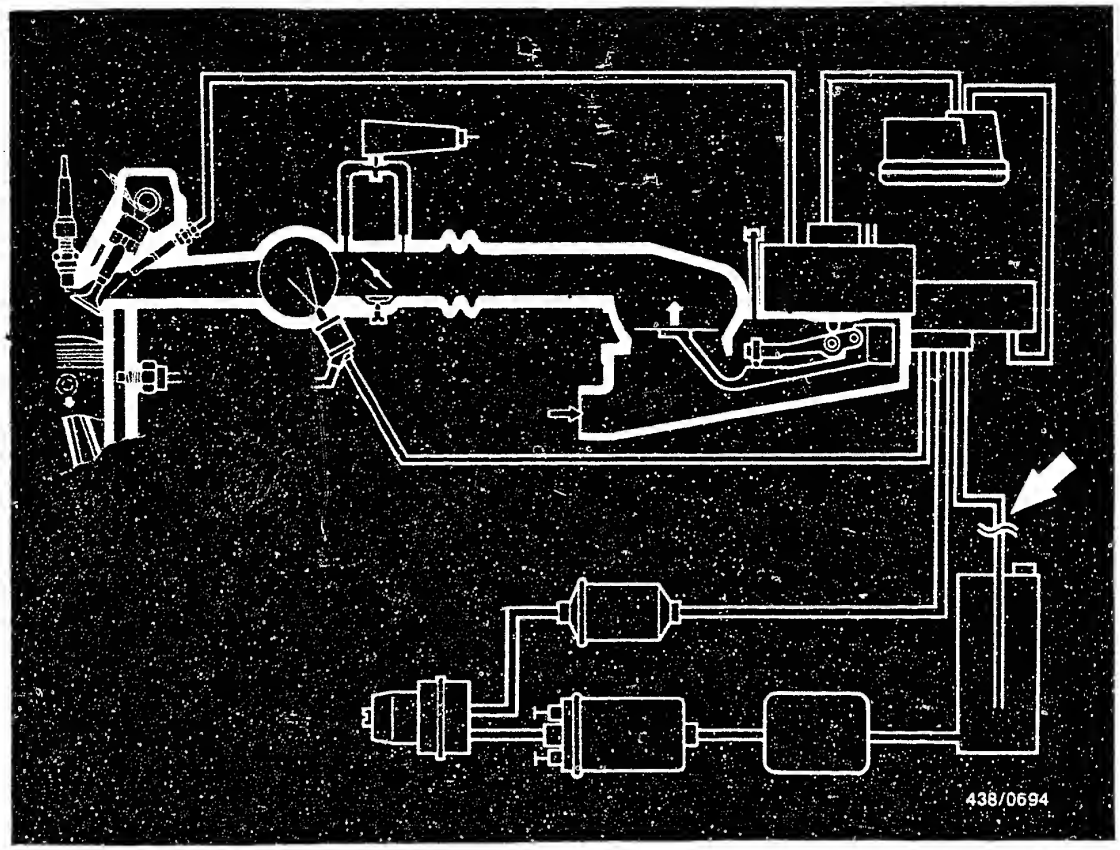
- The engine must be cold.

- Disconnect the electric cable plugs from the auxiliary-air device and warm-up regulator.
- Disconnect both air hoses from the auxiliary-air device.

Since the two hose fittings on the auxiliary-air device are located exactly opposite each other, a visual check can now be made to see if the blocking plate is partially open.
It will be easier to look through the auxiliary-air device with the aid of a flashlight and a mirror, as shown in the illustration.

- If an opening is not visible with the engine cold, replace the auxiliary-air device.
- Fit the electric cable plug on the auxiliary-air device.
- By bridging the electrical safety circuit, supply power to the auxiliary-air device.
  After a maximum of 10 minutes, the opening in the auxiliary-air device must be completely closed by the blocking plate.
- If the blocking plate does not close, check the power supply (open circuit, voltage drop).
  The minimum voltage at the connector is 11.5 V with the engine switched off.
- If these items are in proper condition, check the heating coil in the auxiliary-air device with an ohmmeter for an open circuit.
- Replace a defective auxiliary-air device.

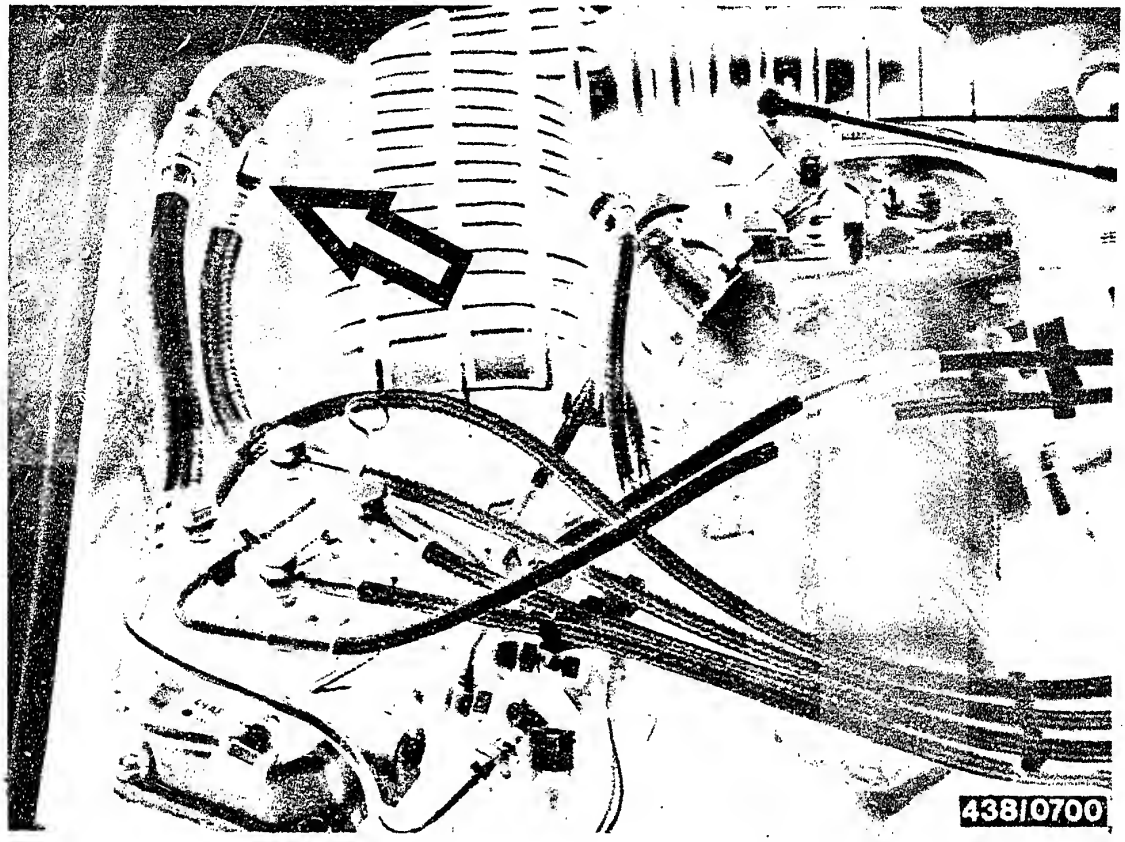
If the auxiliary-air device has been replaced, it is necessary finally to adjust the idle speed with the engine at normal operating temperature.
Ide-speed adjustment is described on Coordinates F 3.



12. Checking the operation of the electric fuel pump.

12.1 Requirement

Conclusive information on the operation of the electric fuel pump can only be given by a measurement of fuel delivery under pressure, i.e. under primary (system) pressure. This measurement must therefore be made at the return line leading to the fuel tank (arrow).



12.2 Measuring point:

A suitable measuring point for testing the fuel delivery is the screw connector (arrow) in the fuel return line to the fuel tank.

Before undoing the bottom connector, open the tank filler cap in order to vent the fuel tank.
Equip a test hose with an inlet union and connect to the return hose of the fuel distributor with inlet-union screw M 14 x 1.5 and copper seal rings. Hold the end of the hose in a graduate, approx. 1.5 liter capacity, in order to make the measurement.

12.3 Testing:

Pull off the plug from the warm-up regulator and auxiliary-air device. Switch on the electric fuel pump for precisely 30 seconds by bridging the safety circuit and measure the fuel delivery in a graduate.

CAUTION!

Never deflect the air-flow sensor plate with the electric fuel pump operating since otherwise fuel will be injected. Subsequent operation of the starting motor may lead to serious engine damage.

12.4 Test specification:

Fuel delivery: at least 750 cm^3/seconds.

12.5 Possible causes of insufficient fuel delivery:

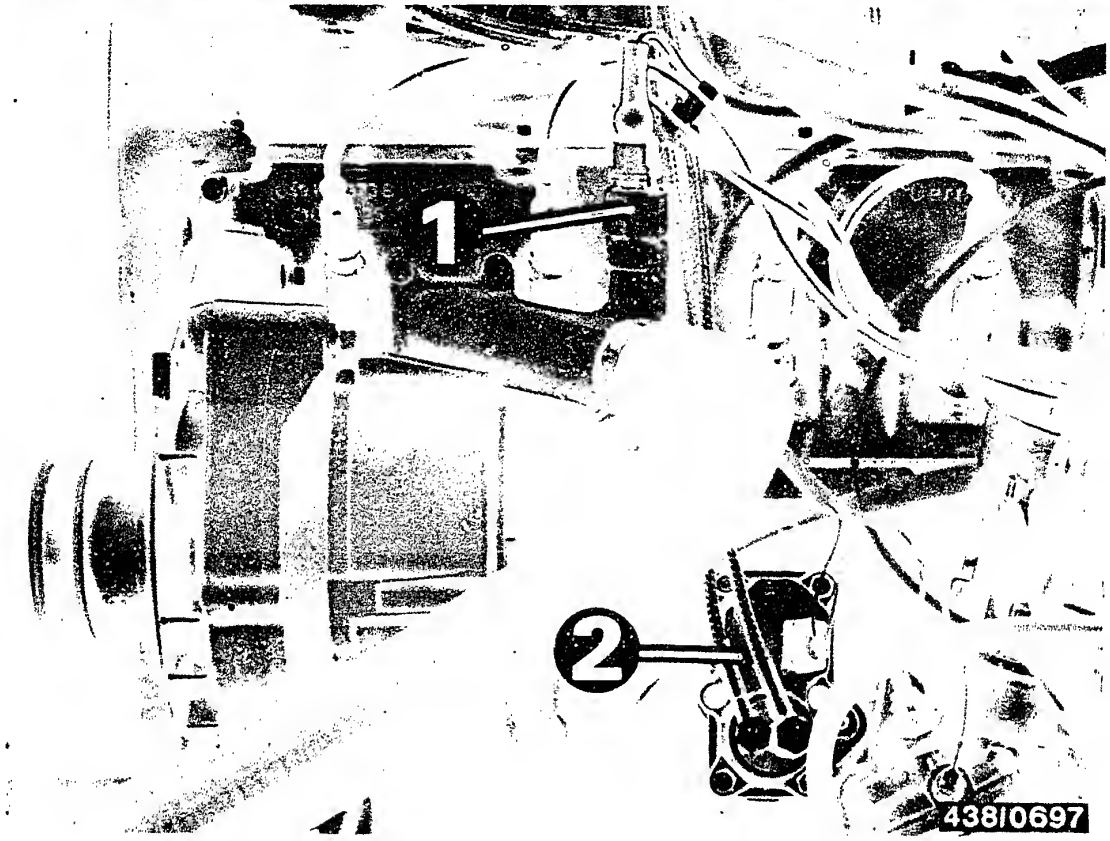
- Power supply to the electric fuel pump defective, voltage drop. Minimum voltage at terminal with pump operating = 11.5 V.
- Pre-filter very dirty.
- Fuel filter very dirty.

If these points are OK, the fault lies in the electric fuel pump itself.
Replace the electric fuel pump.

12.6 Removal and installation of the electric fuel pump:

Pinch off the fuel intake hose from the fuel tank to the electric fuel pump (e.g. using hose clamper W 157 from Matra Co.).

When installing, use a new seal and pay attention to the correct positioning of the electric fuel pump. Danger of bending the fuel lines.

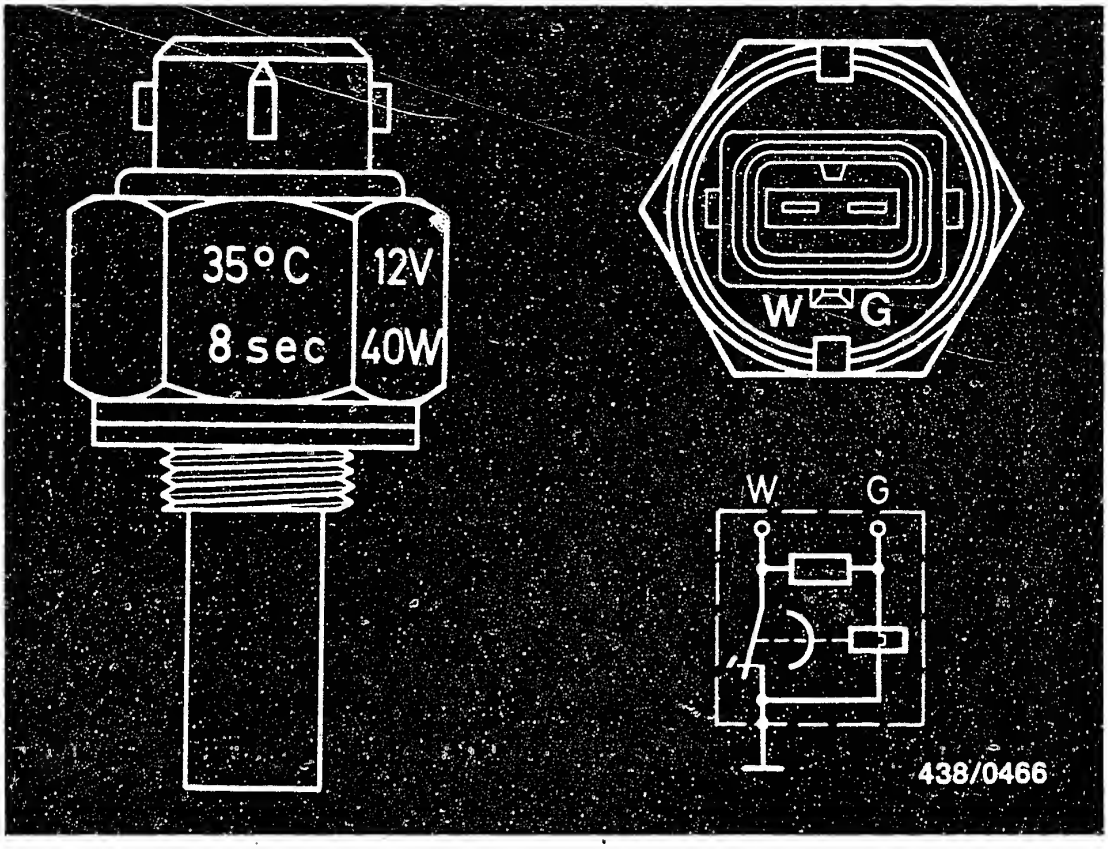


13. Checking the cold-starting system (thermo-time switch, start valve)

13.1 Thermo-time switch

The thermo-time switch (Item 1) is screwed into the fitting of the cooling system.

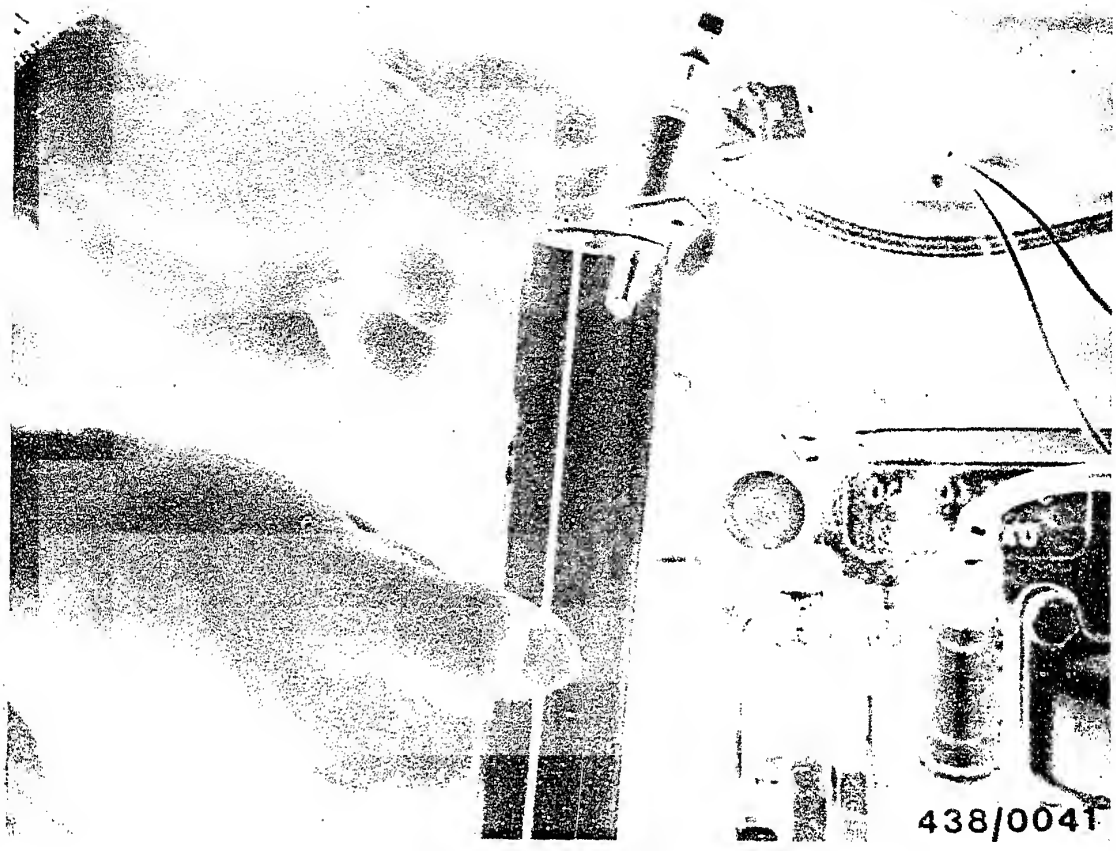
Remove the thermo-time switch for testing.
Remove the plug.
Catch any escaping coolant in a container.



The switching temperature 35°C and the switching time at -20°C of 8 seconds are stamped into the hexagonal section of the thermo-time switch.

The removed thermo-time switch is tested using the ohmmeter in accordance with the specifications given below. The temperatures for the thermo-time switch can easily be obtained with water. Cooling takes place in a freezer chest.

At a temperature below °C	above °C	Resistance measurement (Ω) between Term. "G" and "ground" (housing)	Term. "W" and "ground" (housing)	Term. "G" and "W"
+30		25...40	0	25...40
	+40	50...80	100...160	50...80



13.2 Start valve

Remove the start valve for testing; the fuel line remains connected.
Remove the electric plug and connect the start valve directly to ground and terminal 15 (e.g. on the ignition coil) using connecting cable KDJE 7450/70.

Important note:
Do not hold connecting cable against B + , danger of fire due to sparks!
Hold start valve in container (e.g. graduate).

Switch on the electric fuel pump by bridging the safety circuit.

CAUTION!

Never deflect the air-flow sensor plate with the electric fuel pump operating since otherwise fuel will be injected. Subsequent operation of the starting motor may lead to serious engine damage

Switch on the ignition (max. 30 seconds). The start valve must now open and squirt fuel.

Switch off the ignition, remove the electric connecting cable and dry the nozzle of the start valve.
The safety circuit remains bridged so that the primary pressure is applied to the start valve.
No droplets of fuel must drip from the nozzle of the start valve during the next minute. Even if shaken and knocked, the start valve must not leak.
Then switch the electric fuel pump off again.
Replace the start valve if it does not open or if it leaks.

If a leaky start valve or a defective thermo-time switch has been replaced, it is necessary finally to perform the idle adjustment with the engine at normal operating temperature.
Idle adjustment is described on Coordinate F 3.

14. Checking the control pressures

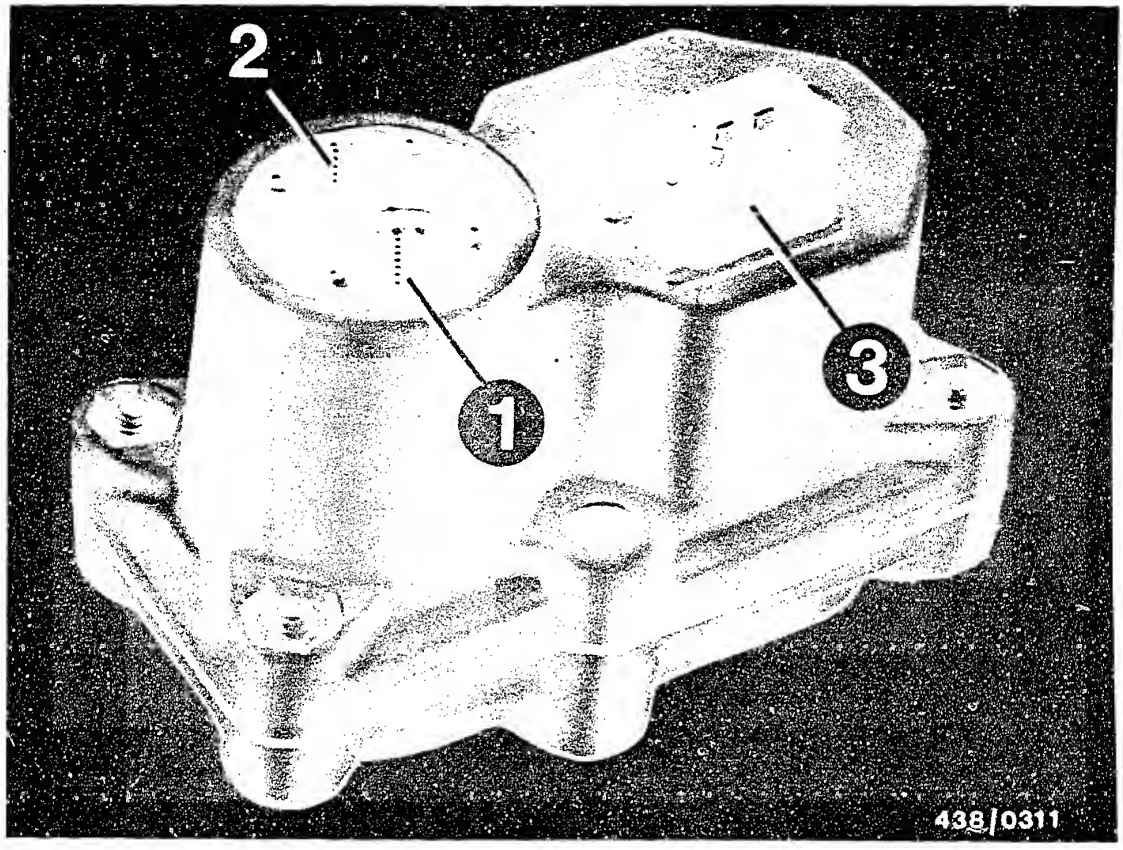
14.1 Preliminary remarks:

The control pressures tested in the following are basically governed by the warm-up regulator.
If the test results are incorrect, however, this may also be due to faults which have nothing to do with the warm-up regulator.

These possible faults are:

- No or too low a voltage at the electric connector.
- Fuel return from the warm-up regulator blocked or constricted.
- Too high or too low fuel delivery for the control-pressure circuit.
  The testing of this control-pressure delivery is described as an additional test step at the beginning of the control pressure tests.
  (Test specification: 160...240 cm^3/min).

Reference is made to the other possible causes of trouble in the respective test step.

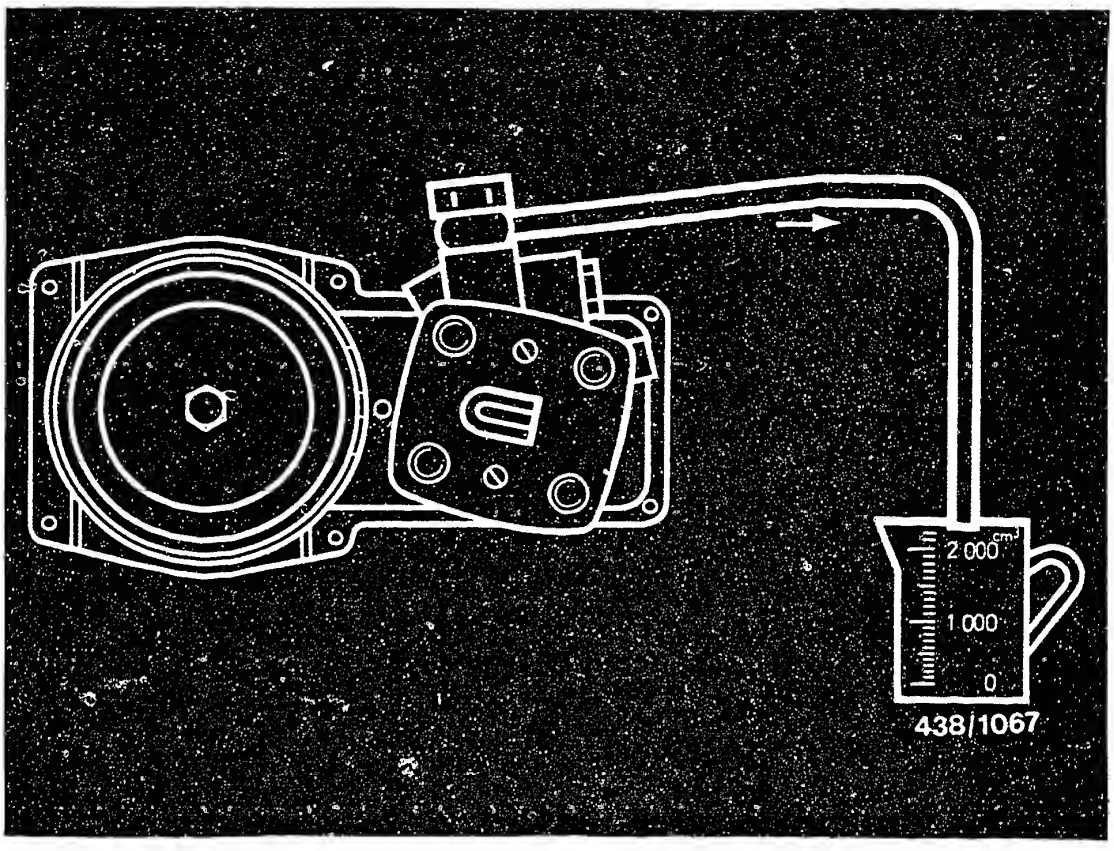


1 = Intake port (M 10 x 1)
2 = Return port (M 8 x 1)
3 = Electrical connection

14.2 Design of warm-up regulator

Warm-up regulator 0 438 140 011/073/074/118/119

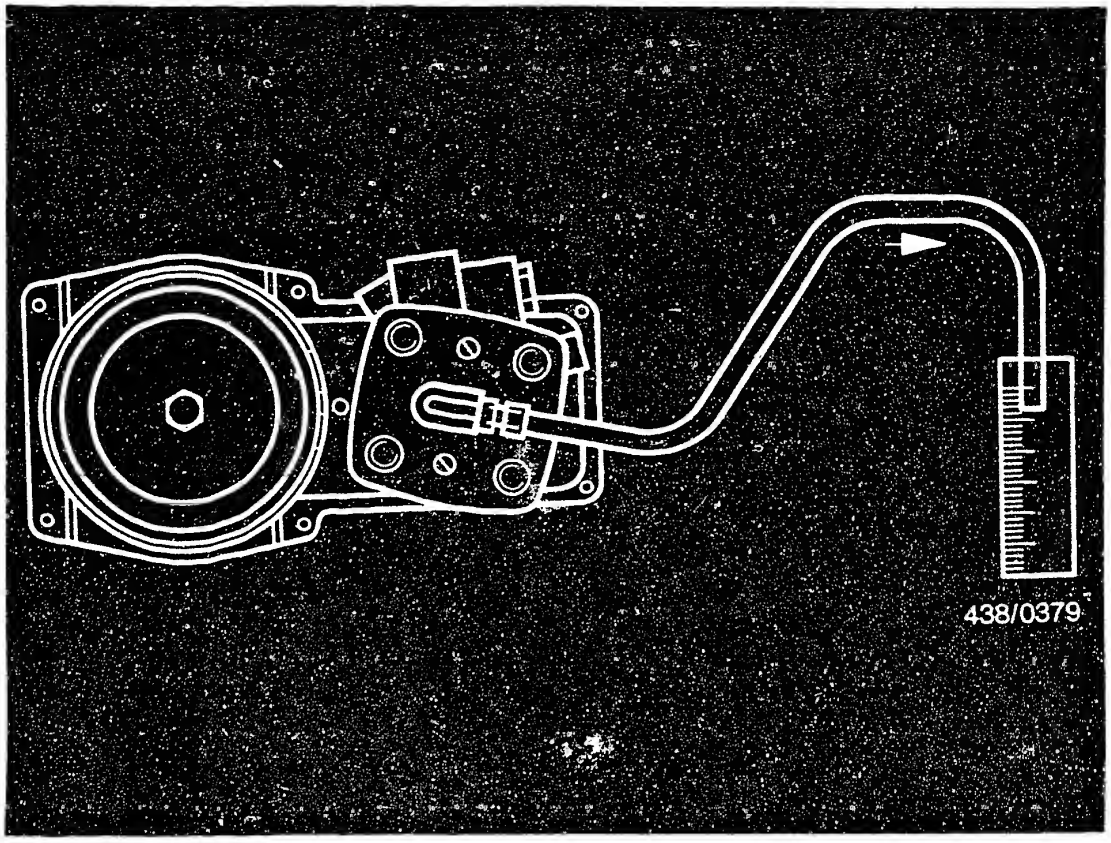
The warm-up regulator corresponds to the standard design, i.e. apart from control pressure "cold" and "warm" no other functions (such as full-load and altitude compensation) are performed.



14.3 Testing the fuel delivery for the control-pressure circuit:

Before testing, make sure that the electric fuel pump is operating correctly.
Test specification: min. 750 cm^3/30 sec.

As the measuring point use the screw connector in the fuel return line to the fuel tank.

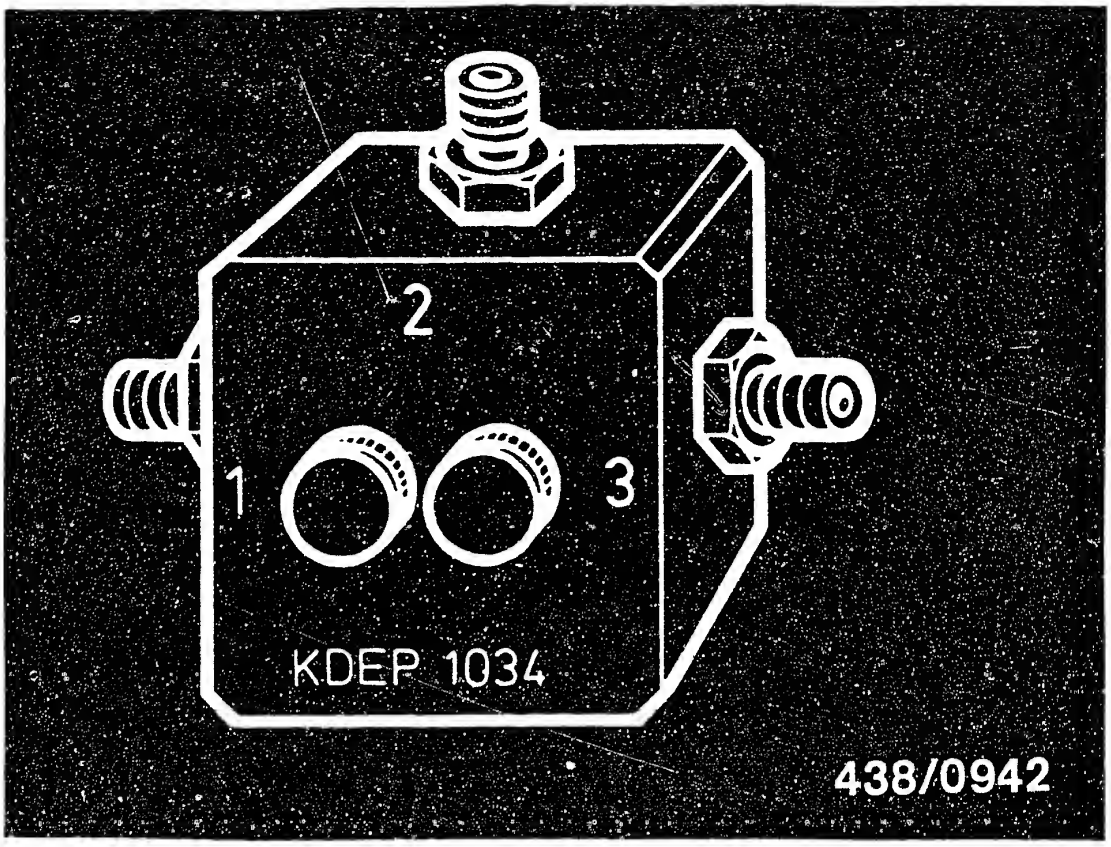


Unscrew the control-pressure line (coming from the fuel distributor) on the warm-up regulator and hold the end of the hose in a graduate (approx. 0.5 l capacity).

Switch on the electric fuel pump for precisely 1 minute by bridging the electrical safety circuit and measure the fuel delivery.

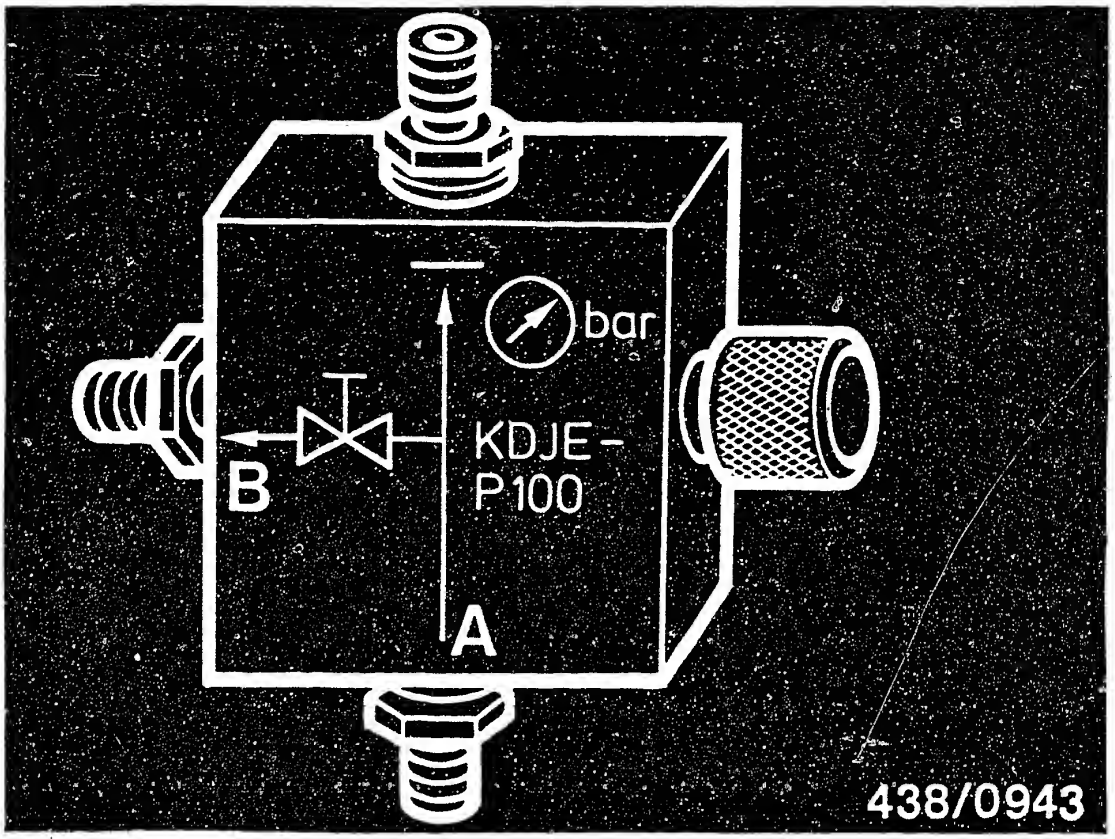
Test specification: 160...240 cm^3/min.

If the measured value is outside tolerance, the cause lies with the fuel distributor.
In this case replace the fuel distributor.



14.4 Mounting the pressure tester KDJE-P 100 (Previously KDEP 1034):

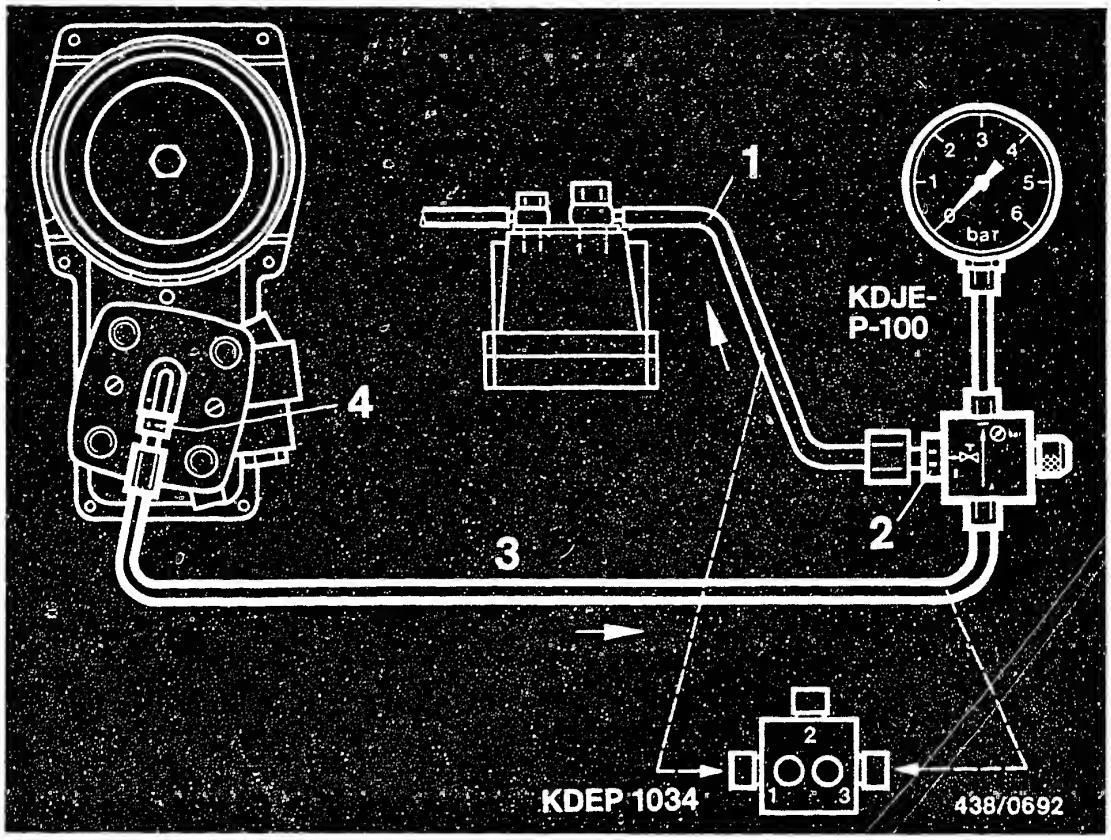
The pressure tester KDEP 1034 is equipped with a three-way valve with 2 separate hollow screws. The connections of the directional-control valve are numbered.



Since the end of 1979 the pressure tester KDJE-P 100 has been supplied. Its directional-control valve has only one hollow screw. The connections of this directional-control valve are identified by symbols:

A = Inlet (from fuel distributor)
B = Outlet (to warm-up regulator)

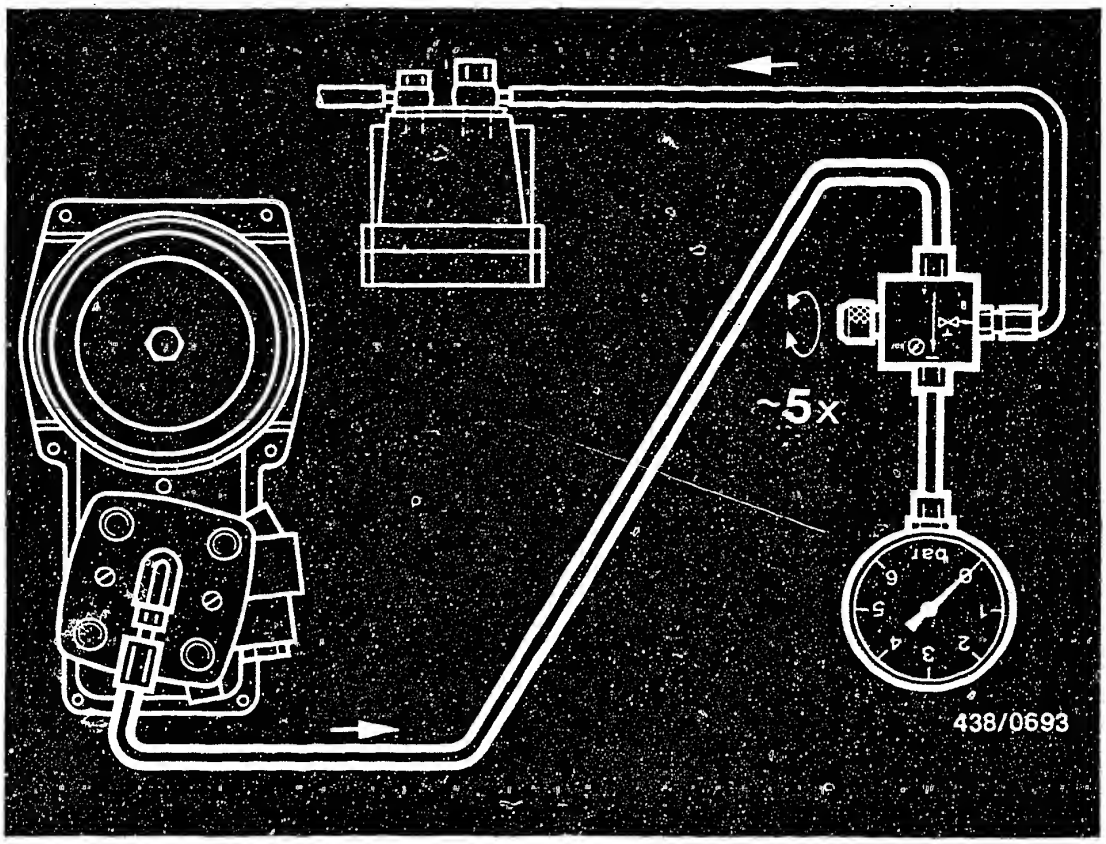
Caution!
When not using the directional-control valve, always keep the hollow screw(s) open so as to take the load off the seal rings.



The directional-control valve of the pressure tester is connected into the control-pressure line from the fuel distributor to the warm-up regulator.

Unscrew the control-pressure line (1) from the fuel distributor and connect to outlet fitting B or 1 (2) of the directional-control valve.

Connect the hose line (3) of the pressure tester to the control-pressure connection port (4) of the fuel distributor. Suspend the pressure gauge from the hood (possibly using a wire hook).



14.5 Bleeding the presssure tester

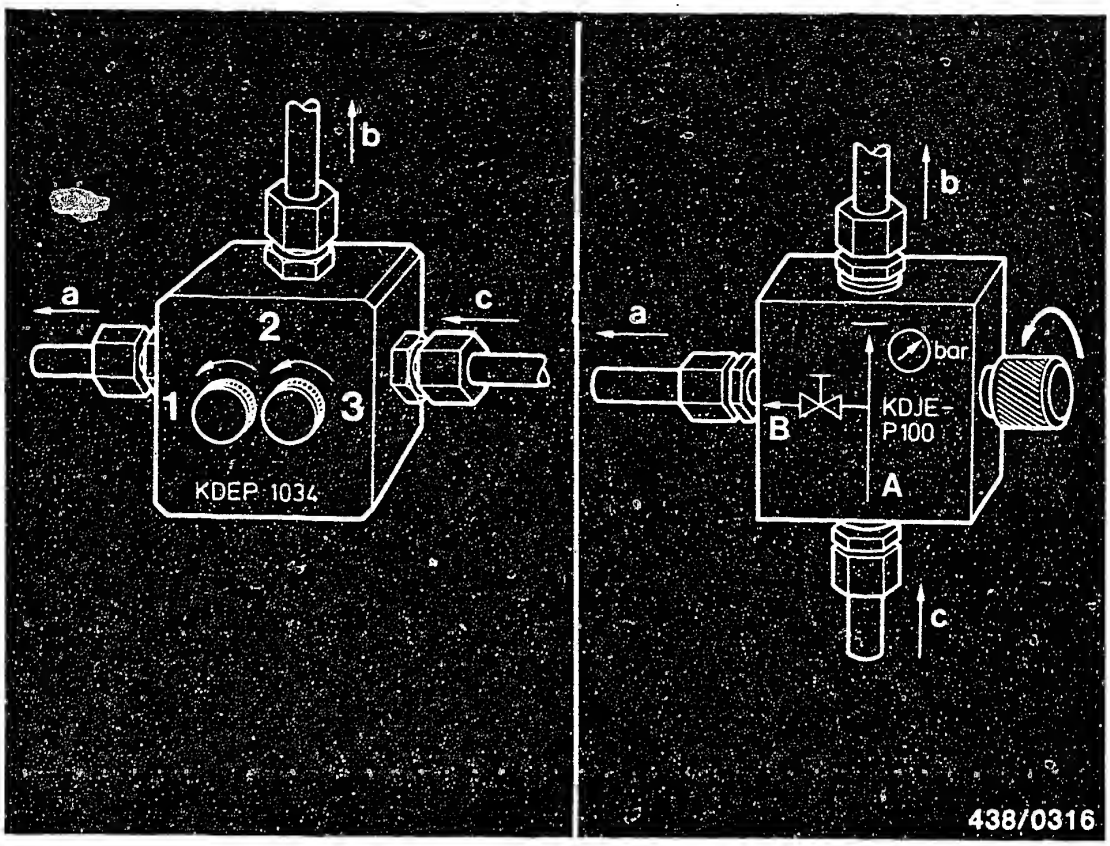
Disconnect the electric plug from the warm-up regulator and the auxiliary-air device.
Let the pressure gauge hang down (hose fully extended).

Switch on the electric fuel pump by briding the electrical safety circuit.

Open and close the valve screw(s) of the directional-control valve in a 10-second rhythm about 5 times.

Then hang the pressure gauge from a **suitable** support (e.g. from one of the struts under the engine hood).

Open valve screw of directional-control valve (both screws in the case of KDEP 1034) (turning to the left).



a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

14.6 Testing the "cold" control pressure

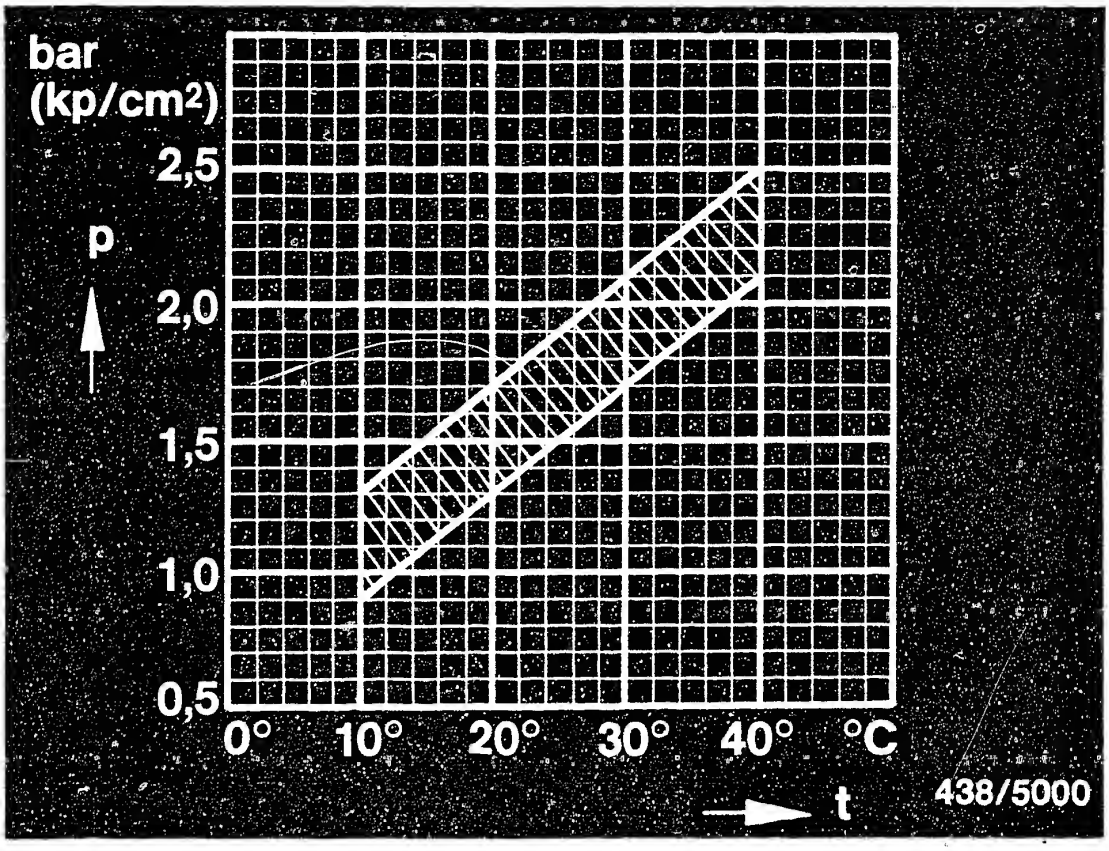
The test is performed with the engine switched off. The engine must be cold. For this purpose, the engine should have been switched off for several hours, preferably overnight.

Pull off the plug from the warm-up regulator.

Open the valve screw of the directional-control valve (both screws in the case of KDEP 1034).

Switch on the electric fuel pump by bridging the electrical safety circuit.

The pressure gauge now indicates the "cold" control pressure.



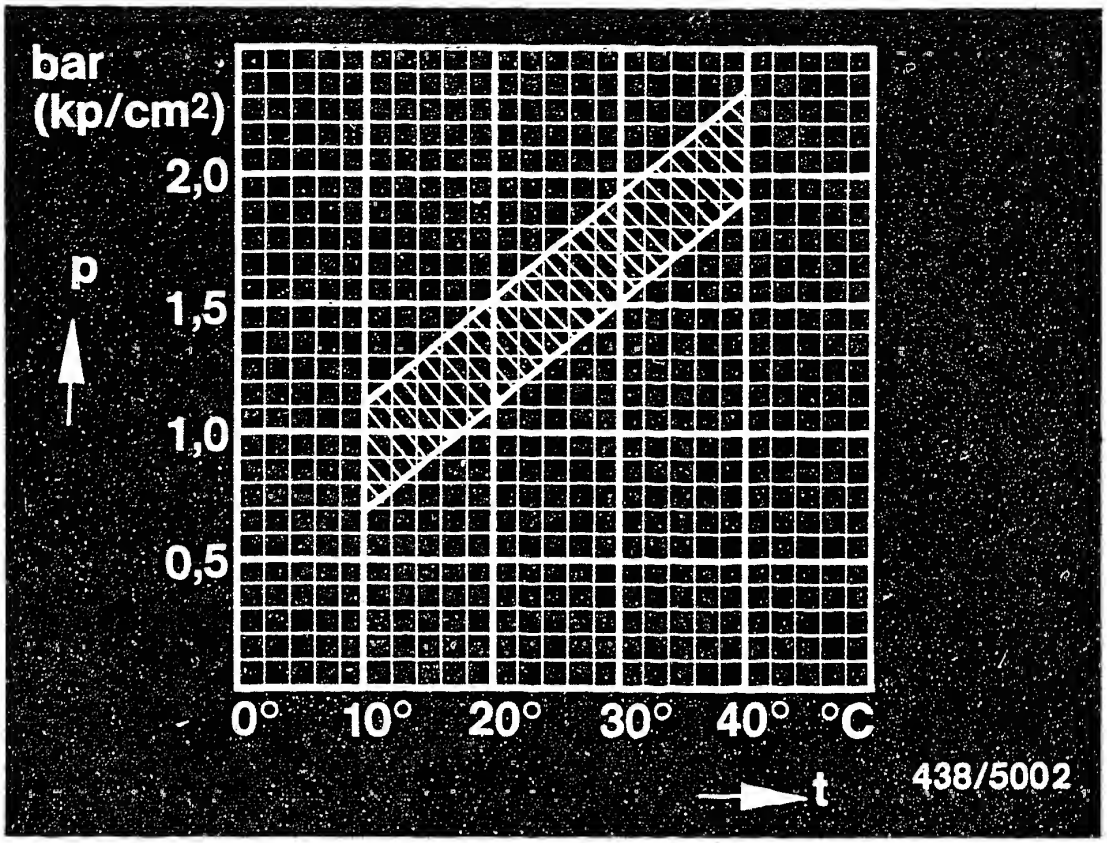
p = Control pressure (gauge pressure)
t = Ambient temperature

Warm-up regulator 0 438 140 011

Basic version

Calculate the nominal control pressure in accordance with the ambient temperatures in the graph.

Example: Ambient temperature = 20 °C
Nominal control pressure = 1.3...1.7 bar (gauge pressure)



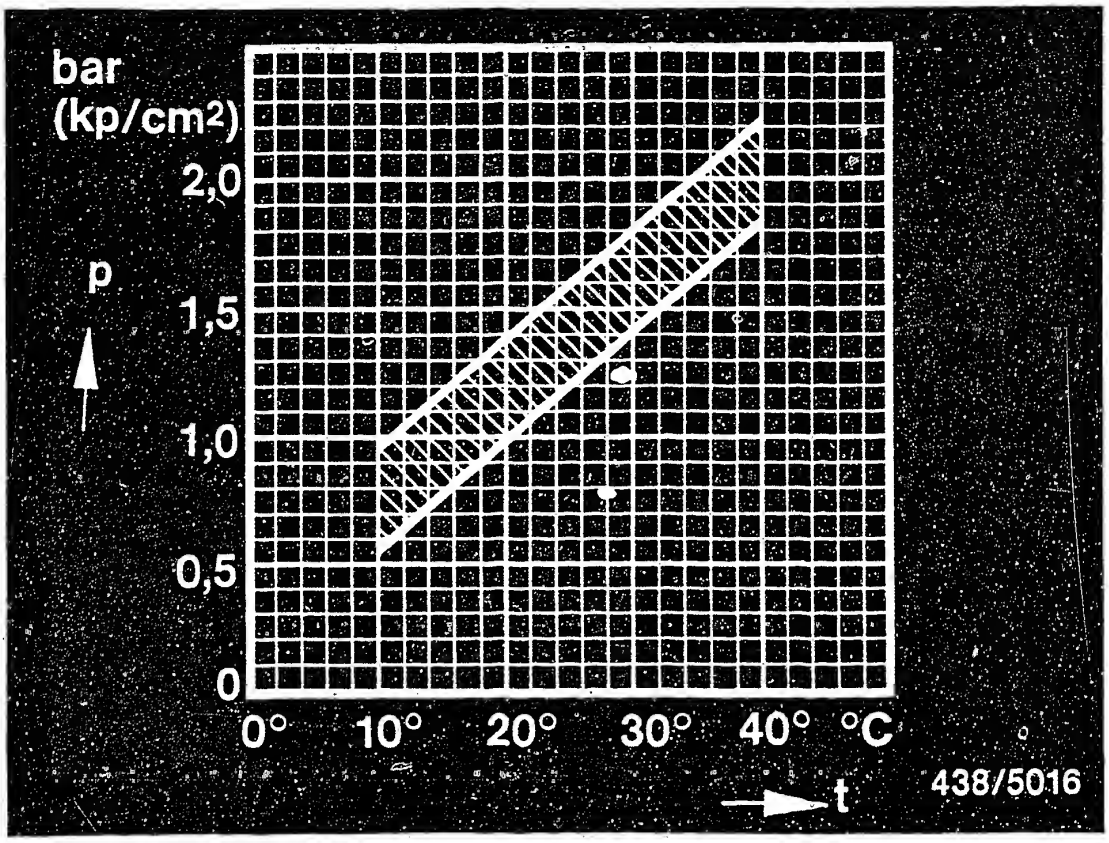
p = Control pressure (gauge pressure)
t = Ambient temperature

Warm-up regulator 0 438 140 073
0 438 140 074

Basic version

Calculate the nominal control pressure in accordance with the ambient temperatures in the graph.

Example: Ambient temperature = 20 °C
Nominal control pressure = 1.1...1.5 bar (gauge pressure)



p = Control pressure (gauge pressure)
t = Ambient temperature

Warm-up regulator 0 438 140 118
0 438 140 119

Basic version

Calculate the nominal control pressure in accordance with the ambient temperatures in the graph.

Example: Ambient temperature = 20 °C
Nominal control pressure = 1.0...1.4 bar (gauge pressure)

If the measured "cold" control pressure differs from the nominal value, this may be due to one of the following faults:

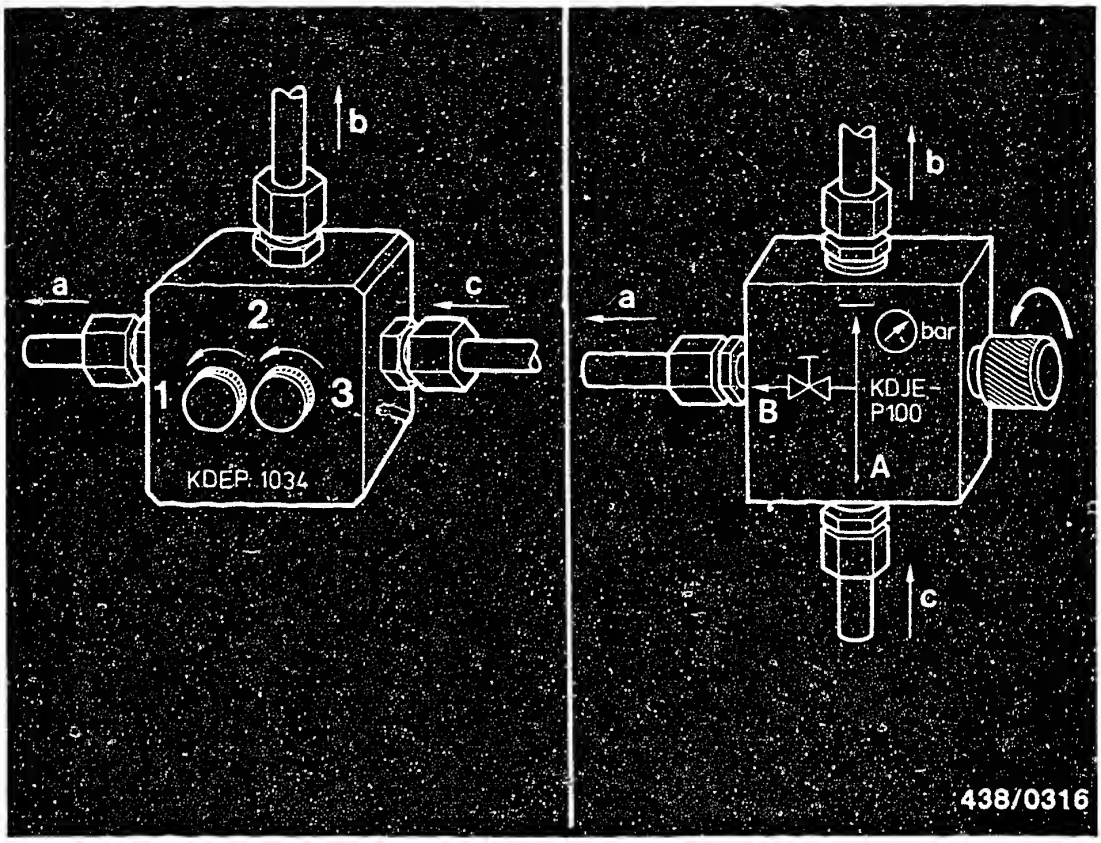
- Fuel delivery for the control-pressure circuit too low or too high. Test fuel delivery.
  Test value: 160...240 cm^3/min.

- Fuel return from the warm-up regulator blocked or constricted (if control pressure too high).
  Eliminate constriction.

- Warm-up regulator defective. Replace warm-up regulator.

If the warm-up regulator has been replaced or a fault remedied, it is necessary finally to perform the idle adjustment with the engine at normal operating temperature.

Idle adjustment is described on Coordinate F3.



a = to warm-up regulator
b = to pressure gauge
c = from fuel distributor

14.7 Checking the "warm" control pressure

Warm-up regulator 0 438 140 011
0 438 140 073
0 438 140 074
0 438 140 118
0 438 140 119

The test is carried out with the engine switched off.
The temperature of the engine is not important.
Open the valve screw of the directional-control valve (both screws in the case of KDEP 1034).
Switch on the electric fuel pump by bridging the electrical safety circuit.

Attach the plug to the warm-up regulator.

Control pressure now rises (the warm-up regulator in the process of shutting off) until the "warm" control pressure is reached.

Test specification for "warm" control pressure:
3.4..,3.8 bar gauge pressure
(3.5...3.9 kgf/cm² gauge pressure)

If the measured "warm" control pressure differs from the test specification, this may be due to one of the following faults:

If control pressure too high:

- Fuel delivery for the control-pressure circuit too high
Test fuel delivery.
Test specification: 160...240 cm³/min.

- Fuel return from the warm-up regulator blocked or constricted.
Eliminate constriction.

- Warm-up regulator has hydraulic defect.
Replace warm-up regulator.

If control pressure too low:

- Power supply open-circuit.

Eliminate open circuit. Ensure that the plug is contacting properly.

- Battery voltage too low, voltage drop.

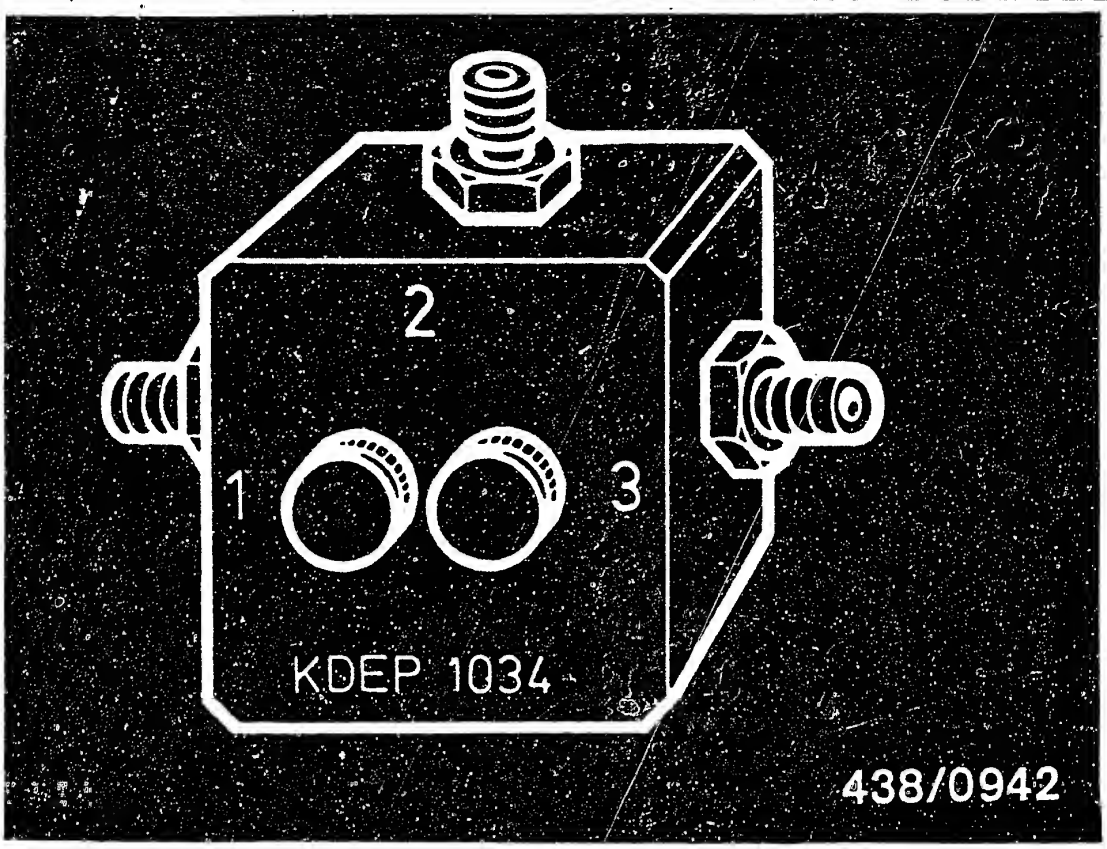
Eliminate voltage drop. Minimum voltage at connector: 11.5 V.
If necessary, repeat test with engine running in order to obtain the normal generator voltage of approx. 14 V when the vehicle is in operation.

- Fuel delivery for the control-pressure circuit too low. Test fuel delivery.
  Test value: 160...240 cm^3/min.

- Warm-up regulator defective. Heating coil open-circuit
  Hydraulic defect

- Replace warm-up regulator.

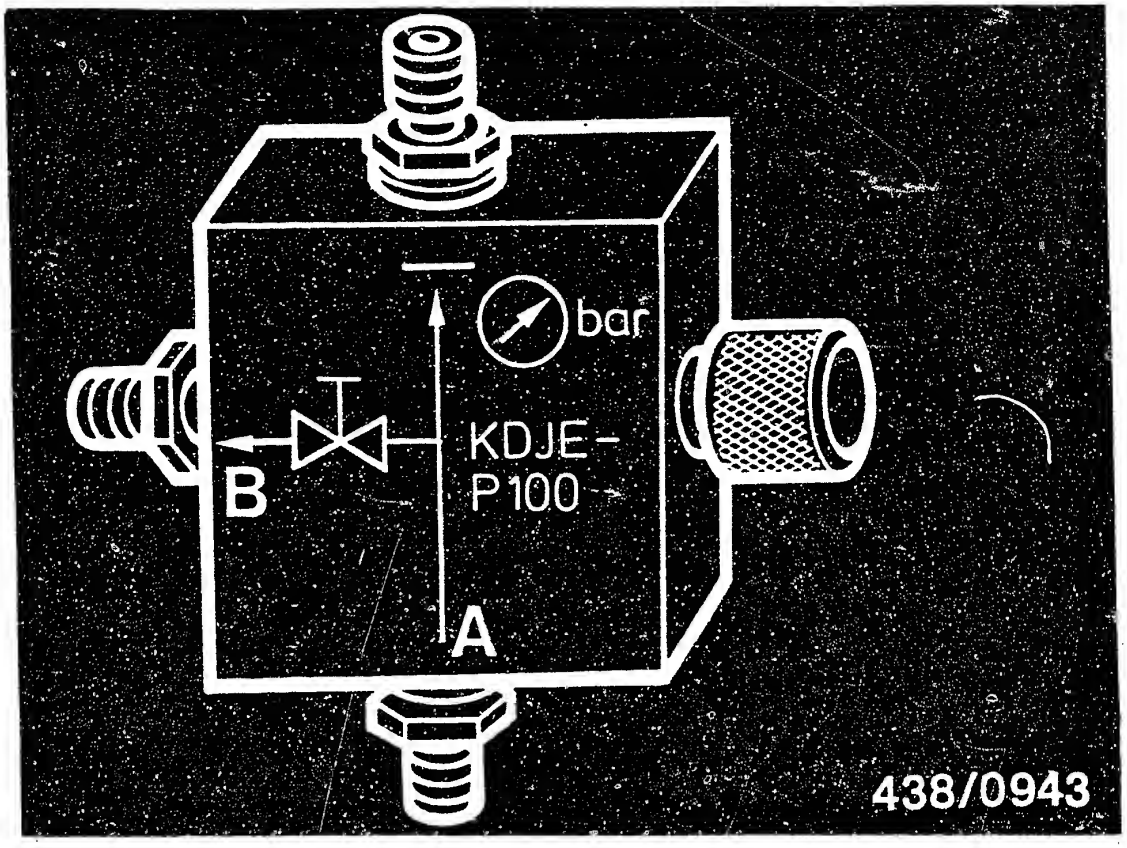
If the warm-up regulator has been replaced or a defect has been eliminated, it is necessary finally to adjust the idle speed with the engine at normal operating temperature.
Idle-speed adjustment is described on Coordinates F 3.



15. Testing and adjusting the primary (system) pressure:

15.1 Mounting the pressure tester KDJE-P100 (formerly KDEP 1034):

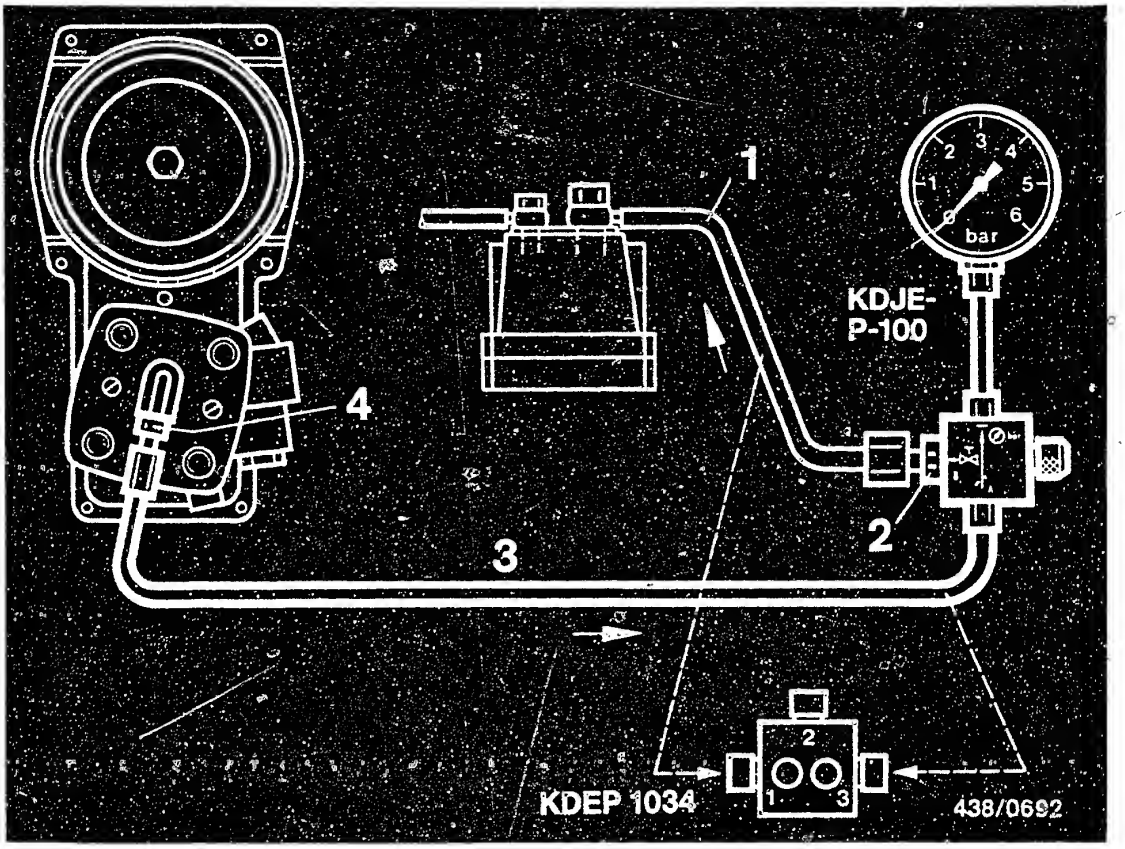
The pressure tester KDEP 1034 is equipped with a three-way valve with 2 separate valve screws. The connections of the directional-control valve are numbered



Since the end of 1979 the pressure tester KDJE-P100 has been supplied. Its directional-control valve has only one valve screw. The connections of this directional control valve are identified by symbols:

A = Inlet (from the fuel distributor)
B = Outlet (to the warm- up regulator)

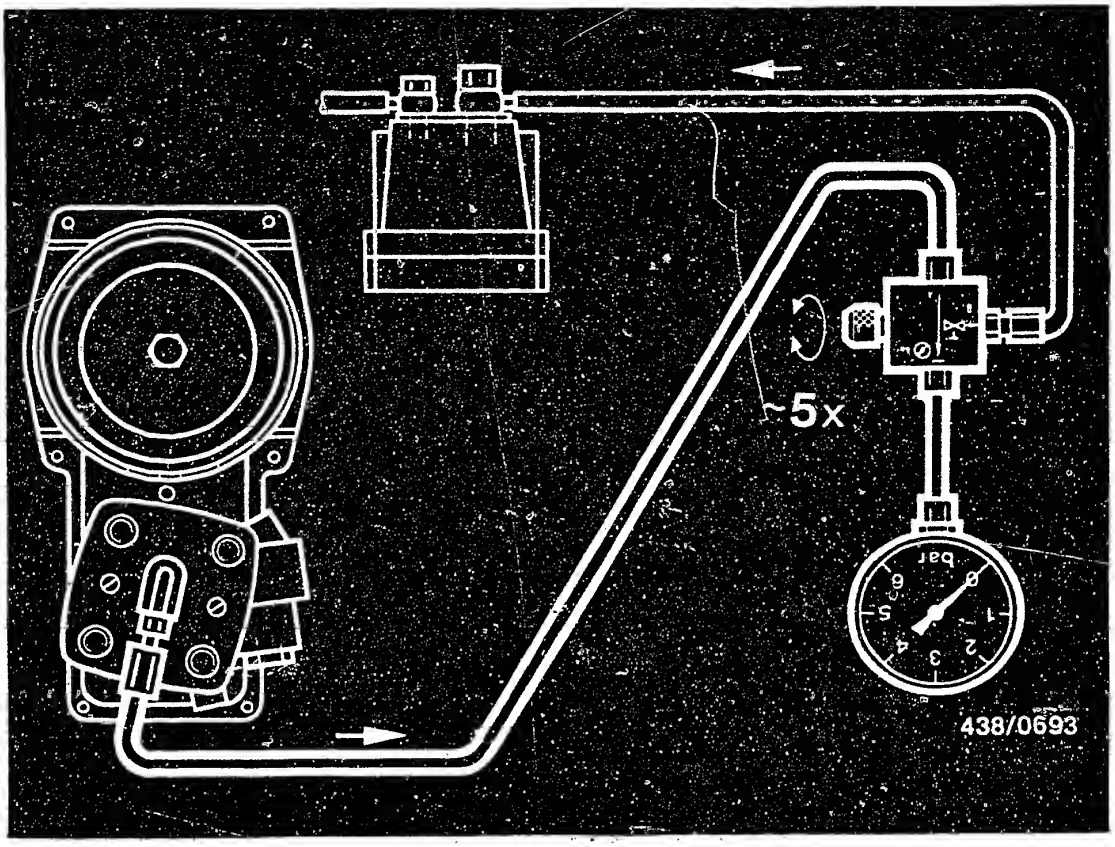
Caution:
When the directional-control valve is not in use, always keep the valve screw(s) open in order to relieve the pressure on the seal rings.



The directional-control valve of the pressure tester is connected into the control-pressure line from the fuel distributor to the warm-up regulator.

Unscrew the control-pressure line (1) from the fuel distributor and connect to outlet fitting B or 1 (2) of the directional-control valve.

Connect the hose line (3) of the pressure tester to the control-pressure connection port (4) of the fuel distributor.
Suspend the pressure gauge from the hood (possibly using a wire hook).



15.2 Bleeding the pressure tester

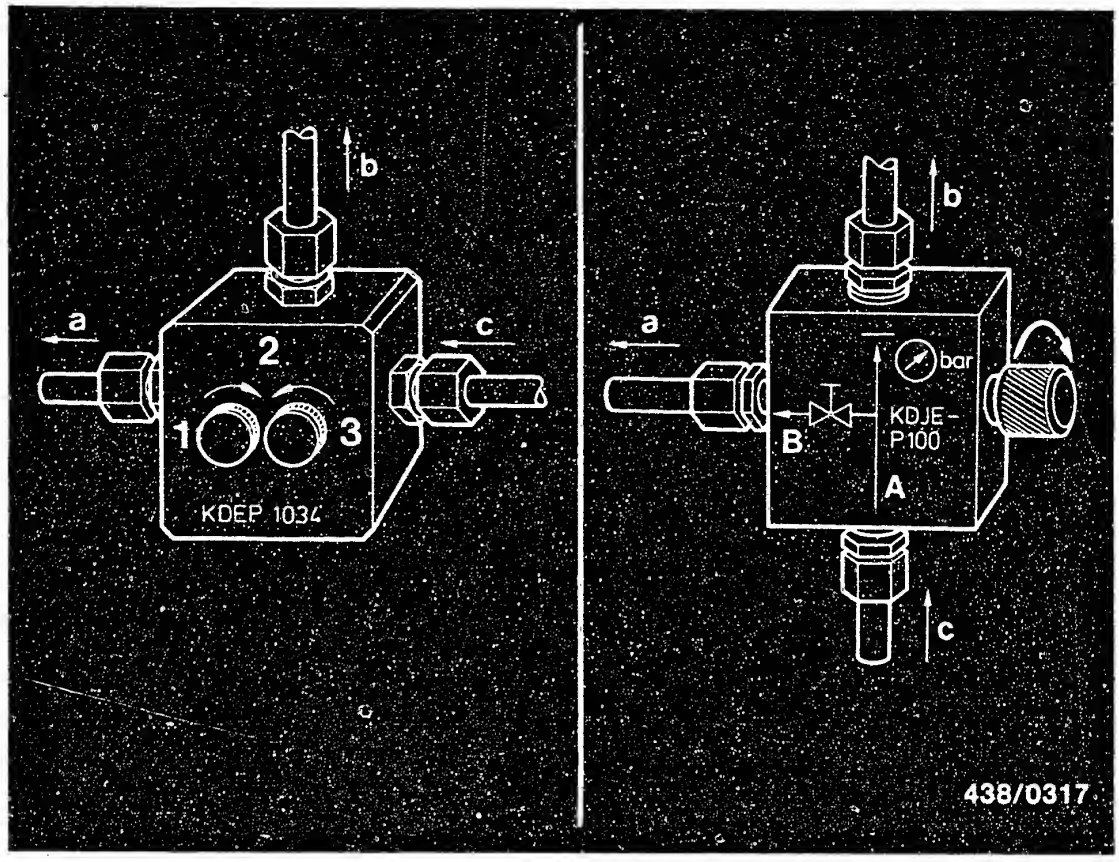
Disconnect the electric plug from the warm-up regulator and the auxiliary-air device.
Let the pressure gauge hang down (hose fully extended).

Switch on the electrical fuel pump by bridging the electrical safety circuit.

Open and close the valve screw(s) of the directional-control valve in a 10-second rhythm about 5 times.

Then hang the pressure gauge from a suitable support (e.g. from one of the struts under the engine hood).

Open valve screw of directional-control valve (both screws in the case of KDEP 1034) (turning to the left).



a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

15.3 Testing the primary pressure:

The test is performed with the engine switched off.
The temperature of the engine is not important.
Close the valve screw of directional-control valve KDJE-P100.
In the case of KDEP 1034, close valve screw 1, open valve screw 3.
Switch on the electric fuel pump by bridging the electrical safety circuit.
The pressure gauge now indicates the primary pressure.

Fuel distributor Part No.	Test specifications - primary pressure (gauge pressure)
0 438 100 005 0 438 100 022 0 438 100 023	4.5...5.2 bar (4.6...5.3 kgf/cm²)
0 438 100 059 0 438 100 061 0 438 100 079 0 438 100 082 0 438 100 100	4.7...5.4 bar (4.8...5.5 kgf/cm²)

Possible causes for too low a primary pressure:

- Fuel supply faulty
(Delivery of electric fuel pump too low).

- Primary pressure set incorrectly.

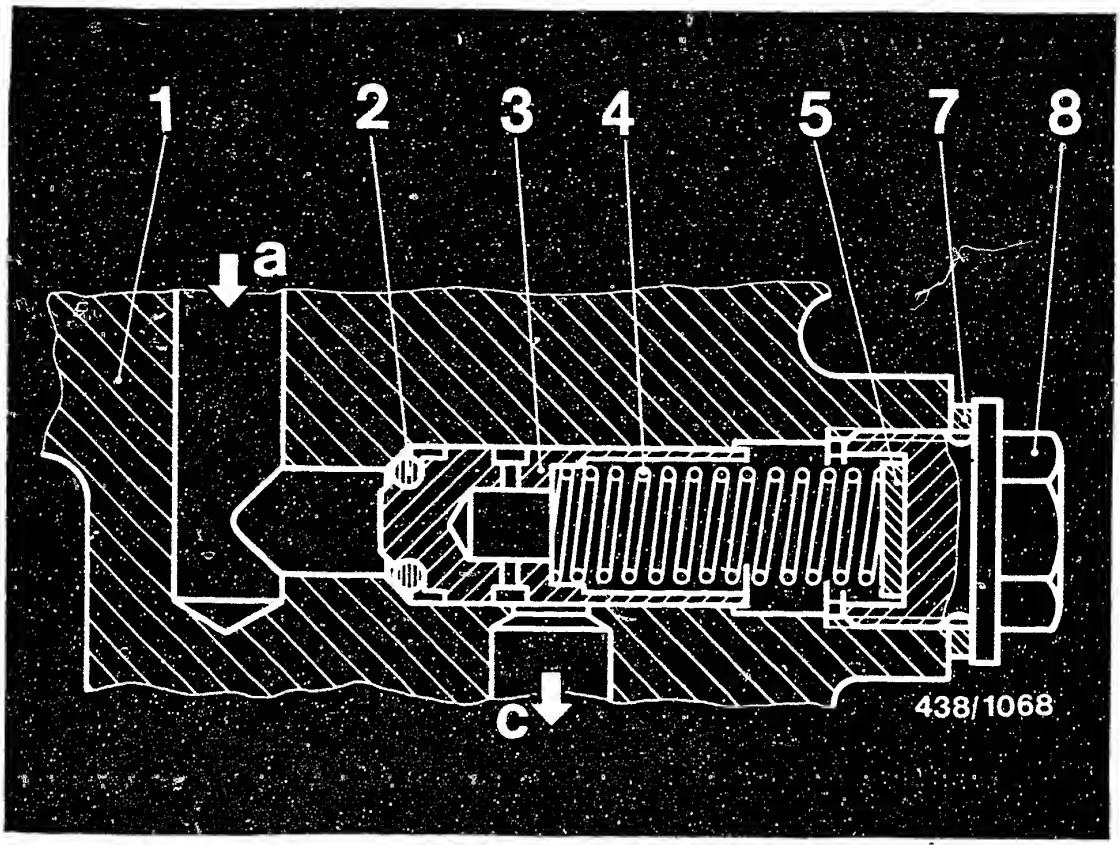
A precondition for readjustment of the primary pressure is always that the fuel supply is in order.
Measure the fuel delivery. (Test specification: at least 750 cm³/30 s.

Possible causes for too high a primary pressure:

- A restriction in the return line leading to the fuel tank.

- Primary-pressure regulator set incorrectly.

For this reason, before readjusting too high a primary pressure, always first check the condition of the return line leading to the fuel tank.

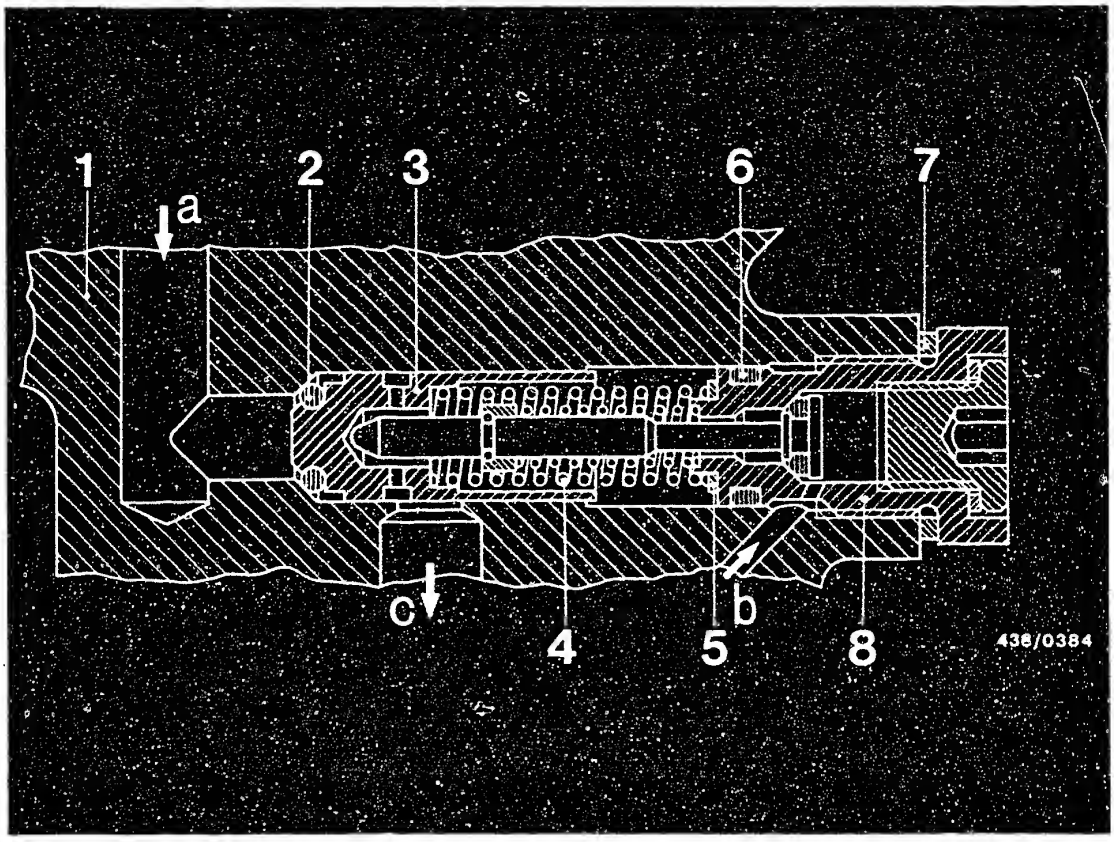


a = Primary pressure
c = Fuel return
1 = Fuel-distributor housing
2 = O-ring
3 = Control piston
4 = Control spring
5 = Shim(s)
7 = Flat seal ring
8 = Screw plug

- The diagram shows fuel distributor 0 438 100 005 (without push valve)

15.4 Adjusting the primary pressure:

Fuel distributor part number	Setting values for primary pressure (gauge pressure)
0 438 100 055 0 438 100 022 0 438 100 023	4.7...4.9 bar (4.8...5.0 kgf/cm²)



a = Primary pressure
b = From warm-up regulator
c = Fuel return
1 = Fuel-distributor housing
2 = O-ring
3 = Control piston
4 = Control spring
5 = Shim(s)
6 = O-ring
7 = Flat seal ring
8 = Screw plug

- The diagram shows fuel distributor with push valve

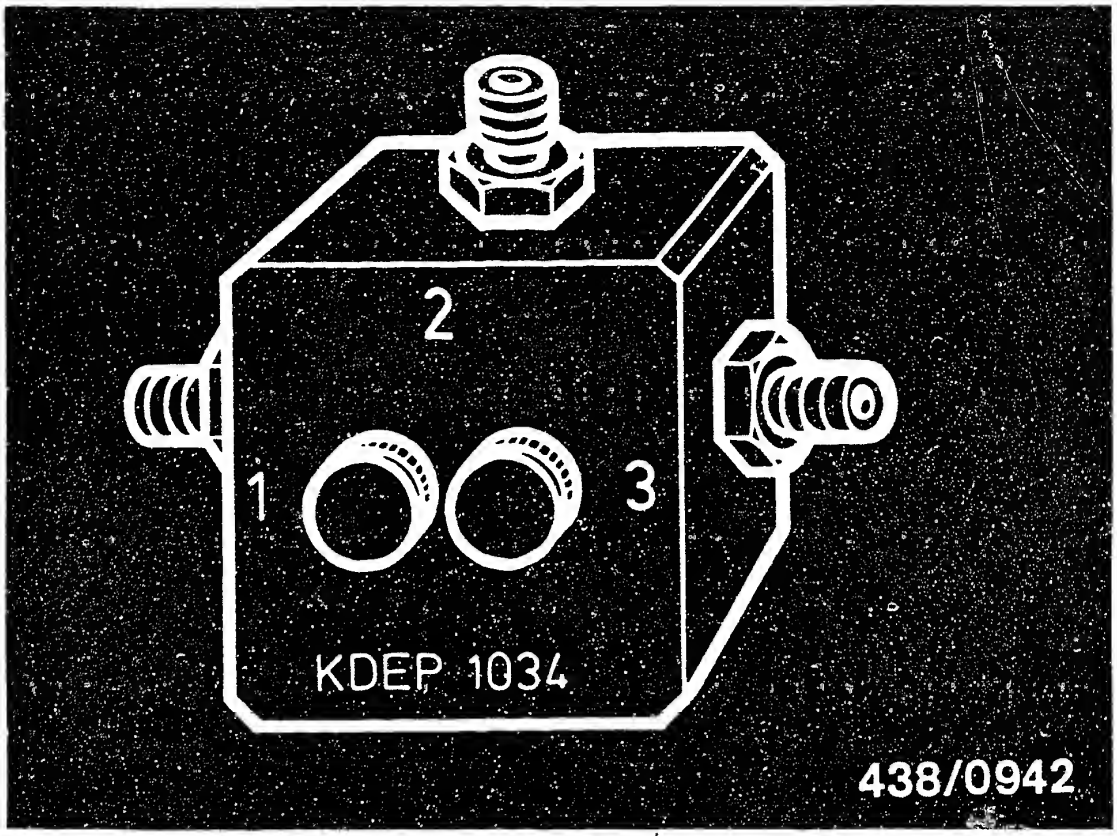
Fuel distributor Part No.	Test specifications- Primary pressure (gauge pressure)
0 438 100 059 0 438 100 061 0 438 100 079 0 438 100 082 0 438 100 100	4.9...5.1 bar (5.0...5.2 kgf/cm²)

The primary pressure is readjusted by replacing the shims (Item 5).

Note:
0.1 mm more of shim thickness means about 0.15 bar pressure increase and vice versa.

To do this, screw out the large screw plug (Item 8) together with the push valve. After carrying out the adjustment, always fit the screw plug with a new flat seal ring (Item 7) and O-ring (Item 6).

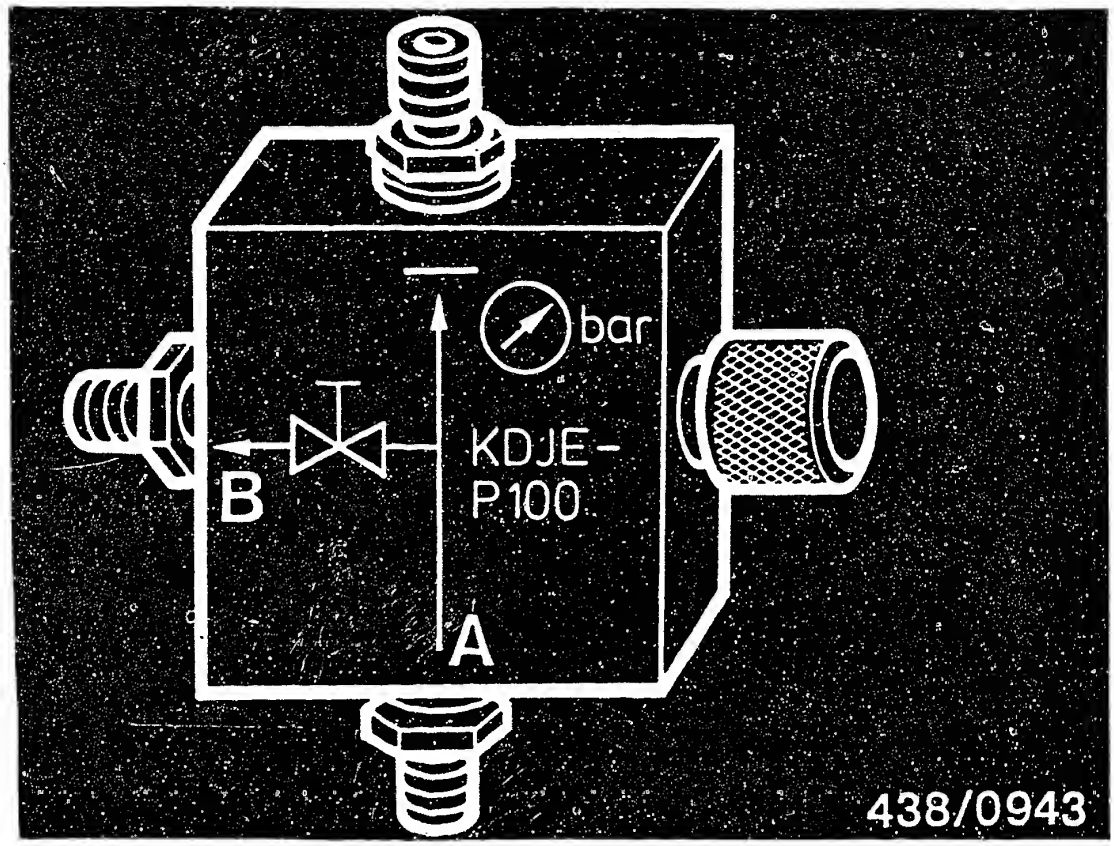
The control piston (Item 3) of the primary-pressure regulator must not be lost. It was matched specially to the fuel distributor housing in the manufacturing plant and therefore is the only part of the primary-pressure regulator which must not be replaced.



16. Testing the entire fuel system for leaks.

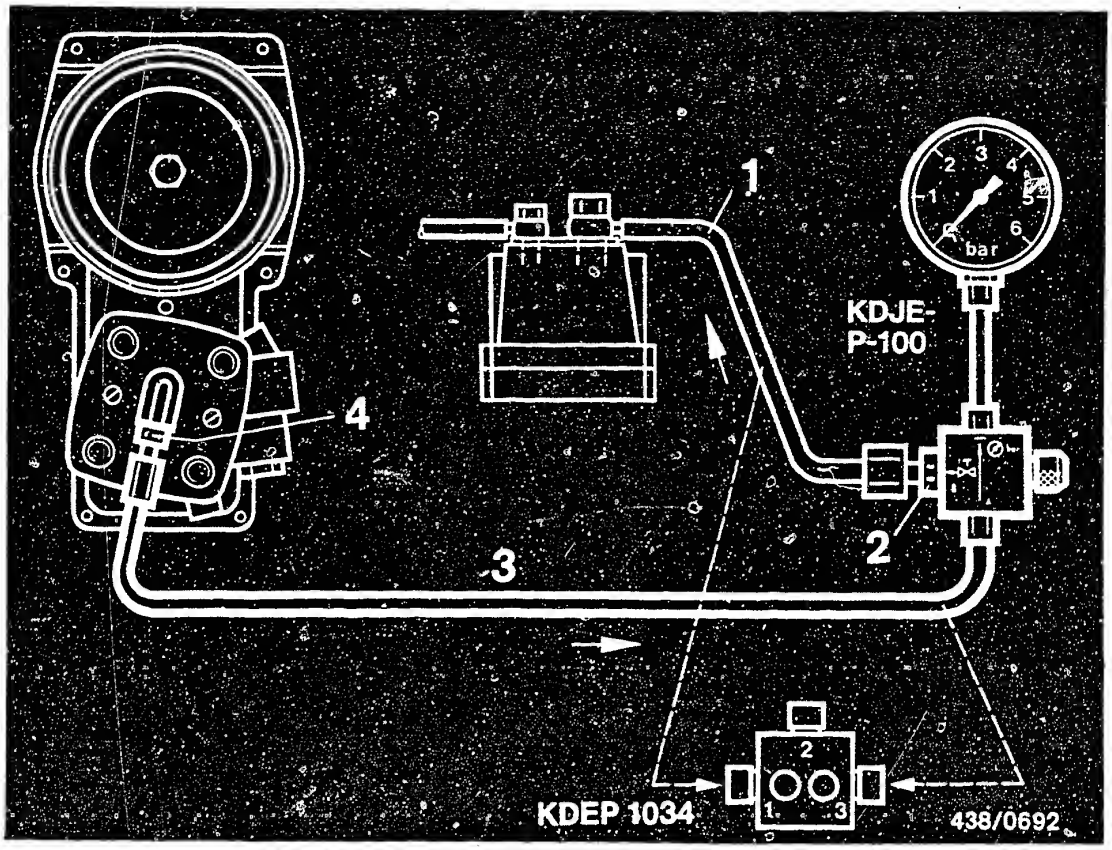
16.1 Mounting the pressure tester KDJE-P 100 (formerly KDEP 1034):

The pressure tester KDEP 1034 is equipped with a three-way valve with 2 separate **valve** screws. The connections of the directional-control valve are numbered (Fig. a).



16.2 Bleeding the pressure tester:

Disconnect the electric plug from the warm-up regulator and the auxiliary-air valve.
Let the pressure gauge hang down (hose fully extended).
Switch on the electric fuel pump by bridging the electrical safety circuit.
Open and close the valve screw(s) of the directional-control valve in a 10-second rhythm about 5 times.
Then hang the pressure gauge from a suitable support (e.g. from one of the struts under the engine hood).
Open valve screw of directional-control valve (both screws in the case of KDEP 1034) (turning to the left).

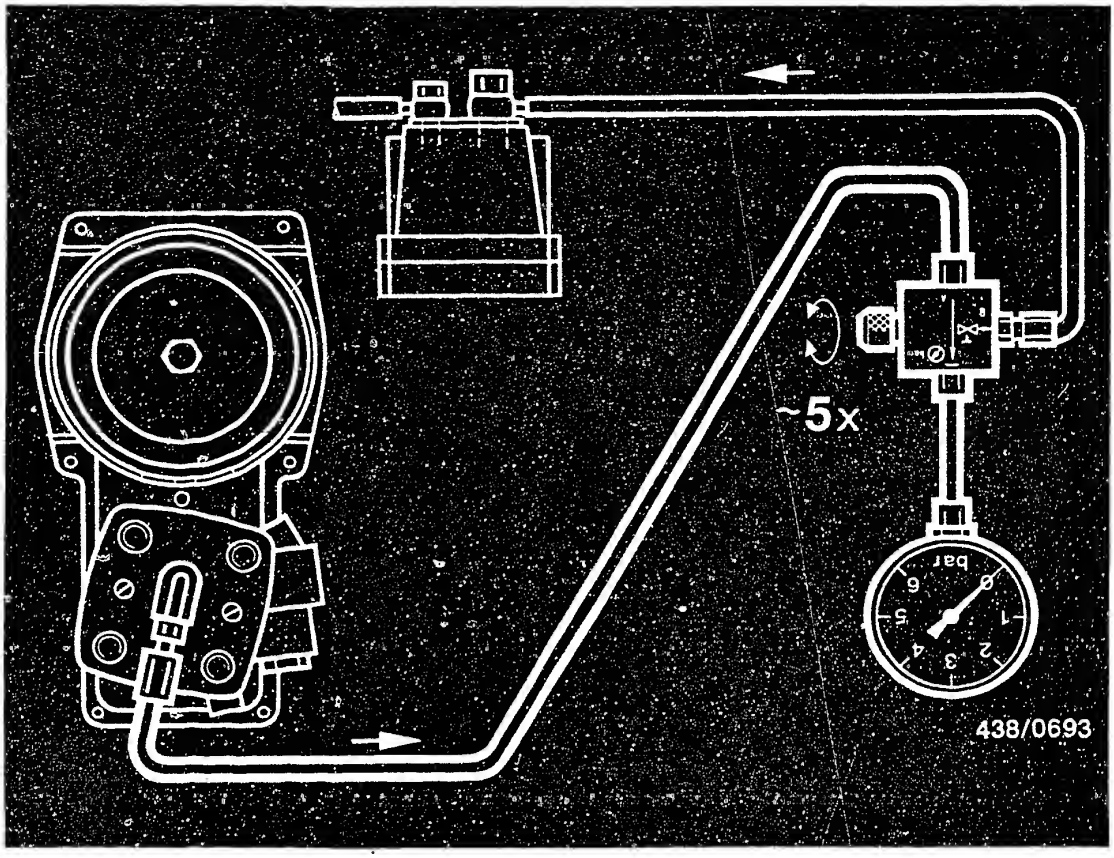


The directional-control valve of the pressure tester is connected into the control-pressure line from the fuel distributor to the warm-up regulator.

Unscrew the control-pressure line (1) from the fuel distributor and connect to outlet fitting B or 1 (2) of the directional-control valve.

Connect the hose line (3) of the pressure tester to the control-pressure connection port (4) of the fuel distributor.

Suspend the pressure gauge from the hood (possibly using a wire hook).

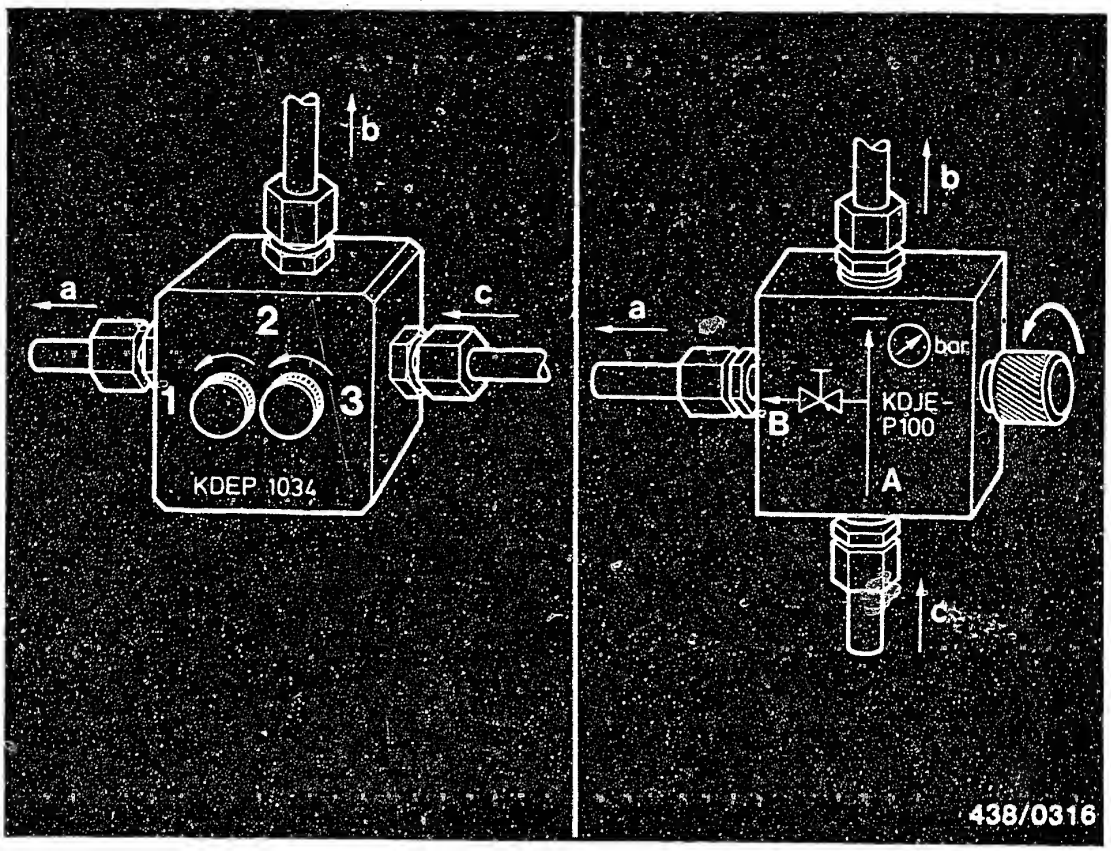


Since the end of 1979 the pressure tester KDJE-P 100 has been supplied. Its directional-control valve has only one valve screw.

The connections of this directional-control valve are identified by symbols:

A = Inlet (from the fuel distributor)
B = Outlet (to the warm-up regulator)

Caution:
When the directional-control valve is not in use, always keep the valve screw(s) open in order to relieve the pressure on the seal rings.



a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

16.3 Leak test:

The test is performed with the engine switched off. Make the test with a warm engine but not immediately after the engine has been operated at a high temperature.
Open the valve screw of the directional-control valve (both valves in the case of KDEP 1034).

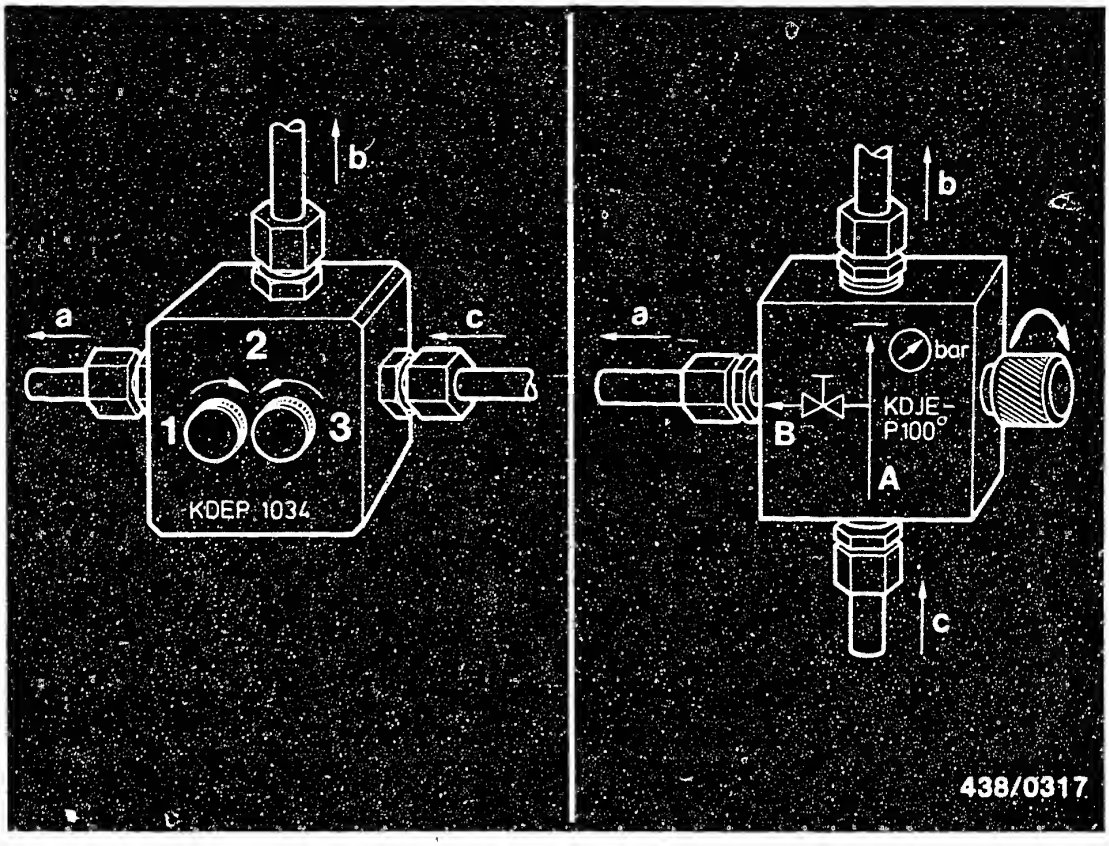
Switch on the electric fuel pump by bridging the electrical safety circuit until the warm-up regulator has ceased to operate ("warm" control pressure).

Switch the electric fuel pump off again and observe the drop in pressure on the pressure gauge.

Test specifications for leak test: *

	Fuel accumulator		0 438 170 001 0 438 170 010 0 438 170 011
	0 438 170 027/028		
	up to FD 931 (identified by blue dot)	from FD 932	
Minimum pressure after			
10 minutes:	2.2 bar (2.3 kgf/cm²)	2.5 bar (2.6 kgf/cm²	2.0 bar (2.1 kgf/cm²)
20 minutes:	2.0 bar (2.1 kgf/cm²)	2.4 bar (2.5kgf/cm²)	1.7 bar (1.8 kgf/cm²)

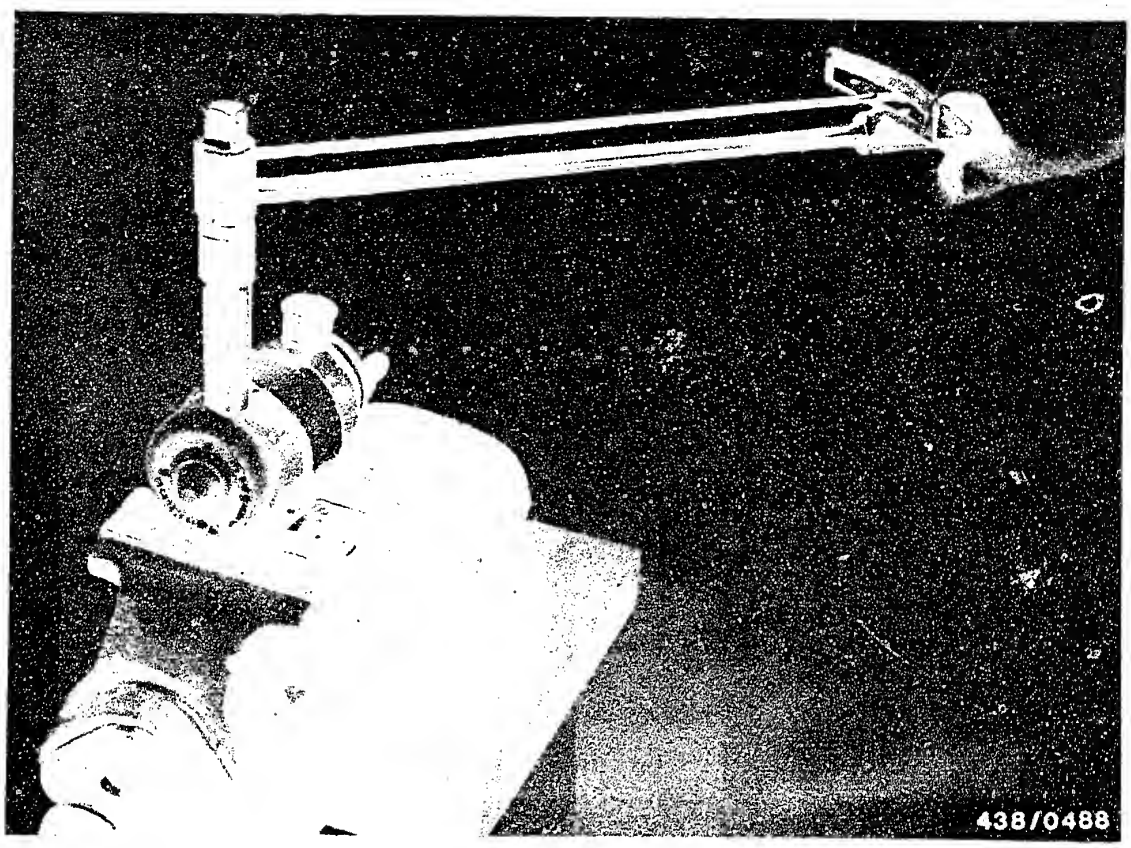
*
Pressures are given in bar (kgf/cm²) gauge pressure.



a = To Warm-up regulator
b = To pressure gauge
c = From fuel distributor

If the pressure drops too quickly, repeat the test with the control-pressure circuit disconnected.

Position of the valve screws:
Close the valve screw of the directional-control valve KDJE-P100.
In the case of KDEP 1034, close valve screw 1, open valve screw 2.
If the same result is found, the leak is in the primary-pressure circuit.
If the test results are correct during the second test, the leak is in the control-pressure circuit.



16.4 Possible causes of trouble in the primary-pressure circuit:

- Non-return valve in tube fitting of electric fuel pump leaking.

Electric fuel pump part no. 0 580 254 992 in 1975/1976 model.
Pump type EKP I with steel housing and lateral tube fitting.
The non-return valve is integrated in the tube fitting.

Completely remove the electric fuel pump in order to change the tube fitting with non-return valve.

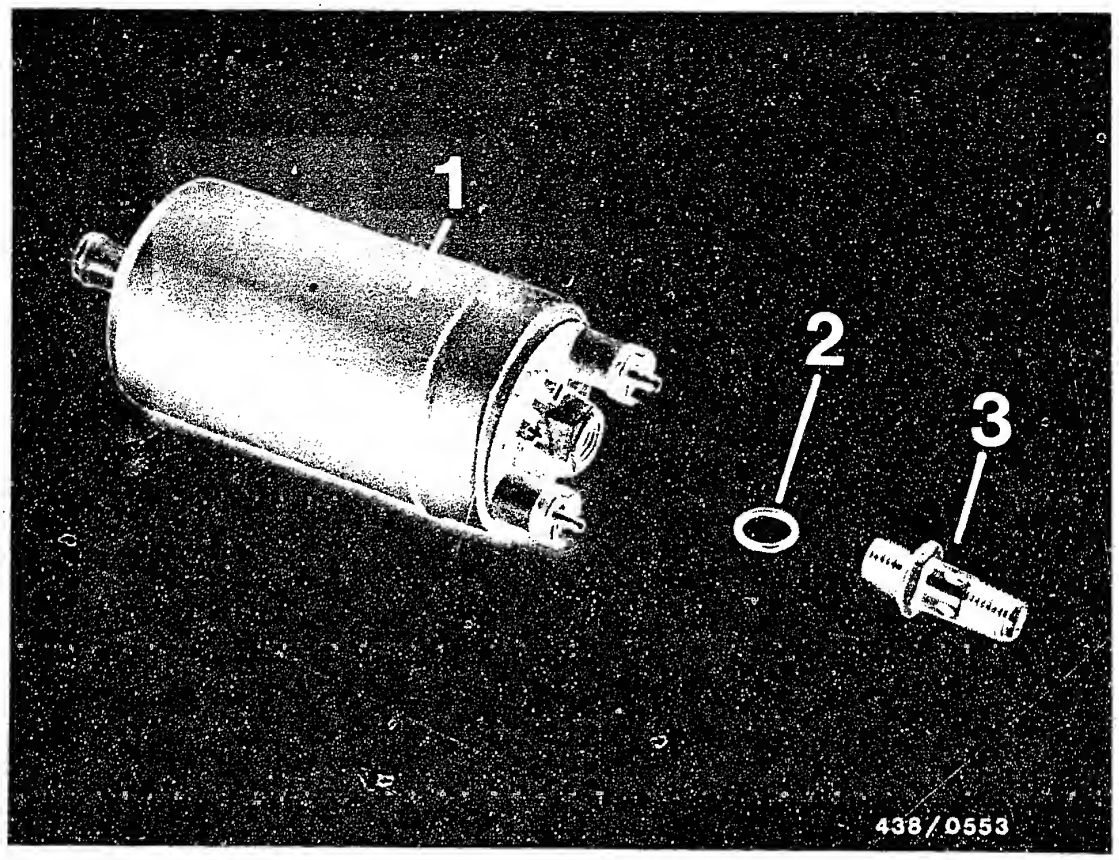
Clamp the pump in a vise by its mounting clamp (never clamp in by the pump housing). Remove delivery hose from tube fitting and screw off fitting.

Caution: Make sure that no dirt or chips get inside the pump.

Screw in new tube fitting from parts set 1 587 010 001 with new seal ring.
Tightening torque 16...20 Nm (1.6...2.0 kgfm).

Caution: Use only the specified seal ring, since special dimensions. Be sure to observe the specified tightening torque. Do not exceed it since, otherwise, there is danger of housing warping and damage to threads.

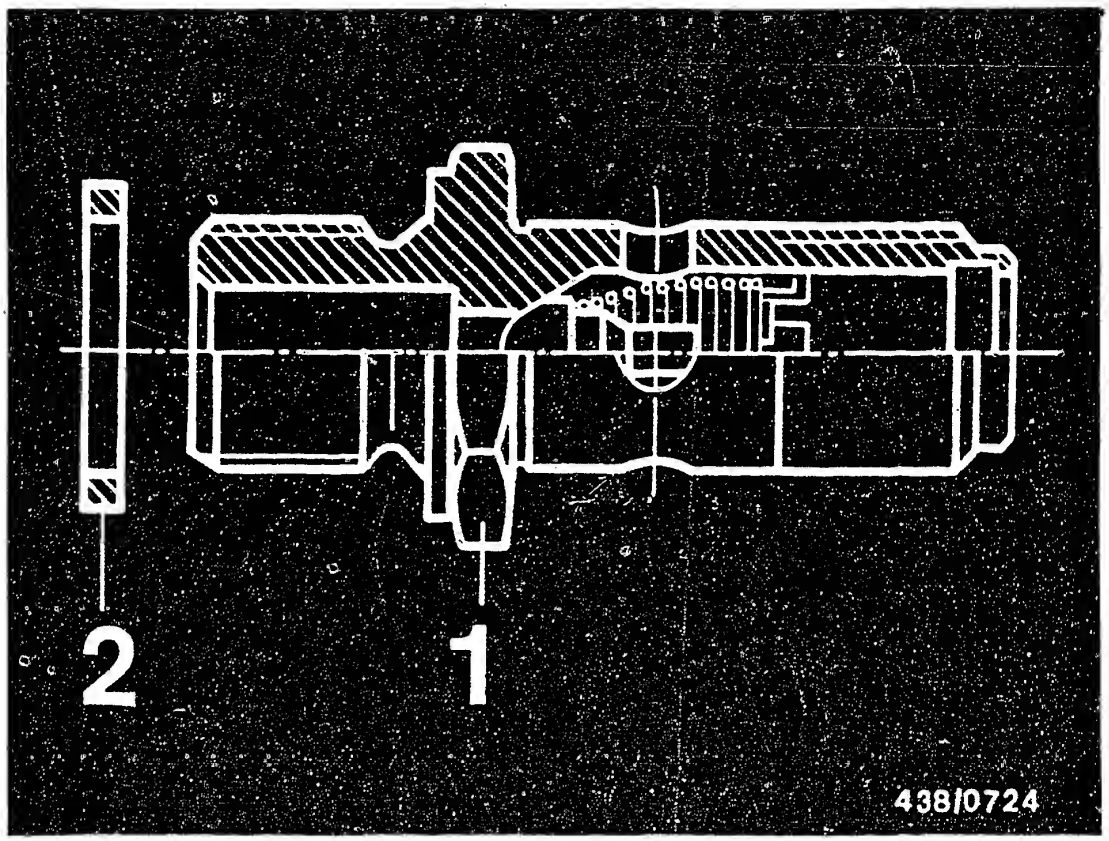
Test the connections for leaks with the electric fuel pump operating.



1 = Electric fuel pump
2 = Flat seal ring
3 = Tube fitting

Part number of electric fuel pump: 0 580 254 959/960
As of 1976 model 0 580 254 961/962
0 580 254 965/966
0 580 254 970/971
0 580 254 980/981

Pump type EKP IV with aluminum housing and axial tube fitting.
The non-return valve is integrated in the tube fitting.



1 = Tube-fitting with built-in non-return valve
2 = Flat seal ring

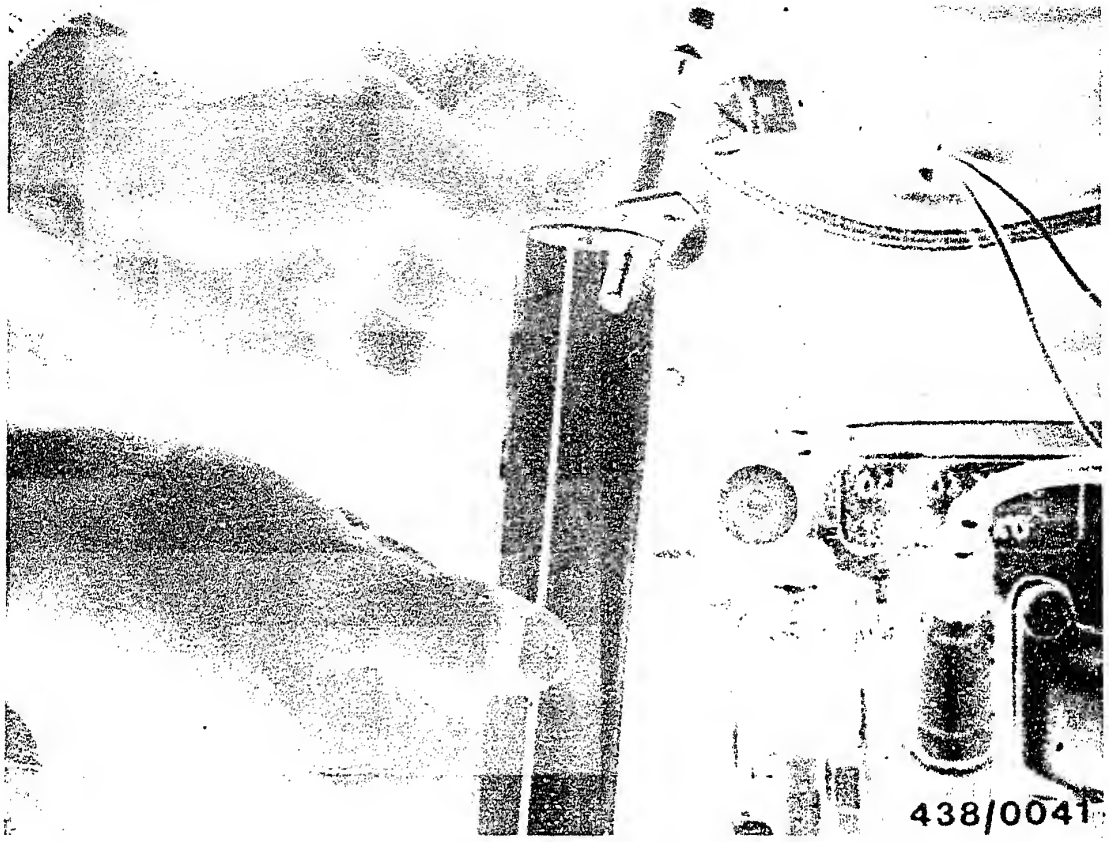
Parts set: 1 587 010 002

If necessary, replace the tube fitting from the parts set 1 587 010 002 as follows:

Thoroughly clean the connection of the delivery line on the electric fuel pump.
Pinch off the intake hose (fuel tank - electric fuel pump) (e.g. using hose clamper W 157 from Matra Co.).
Screw off the delivery line, collecting any escaping fuel.
Screw out the defective tube fitting.

Screw a new tube fitting (short end) with thick flat seal ring into the pressure connection piece and tighten to a torque of 17...25 Nm while at the same time applying a wrench to the hexagonal section of the pressure connection piece. Fit a thin flat seal ring, fuel-line inlet union and another flat seal ring onto the long end of the tube fitting and tighten with the hexagon cap nut.
Remove hose clamper from intake hose.

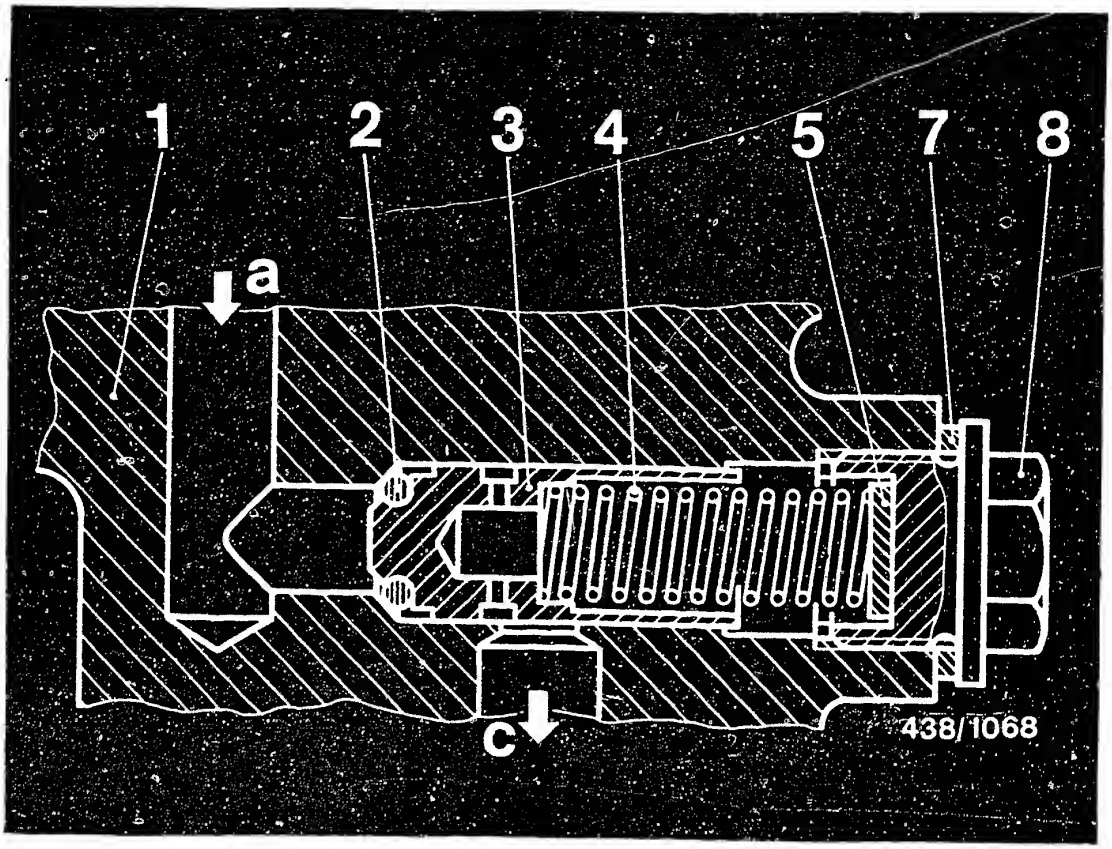
Check connections for leaks with the electric fuel pump in operation.



• The cold start valve has a leak

Remove cold-start valve. Hose line remains connected.

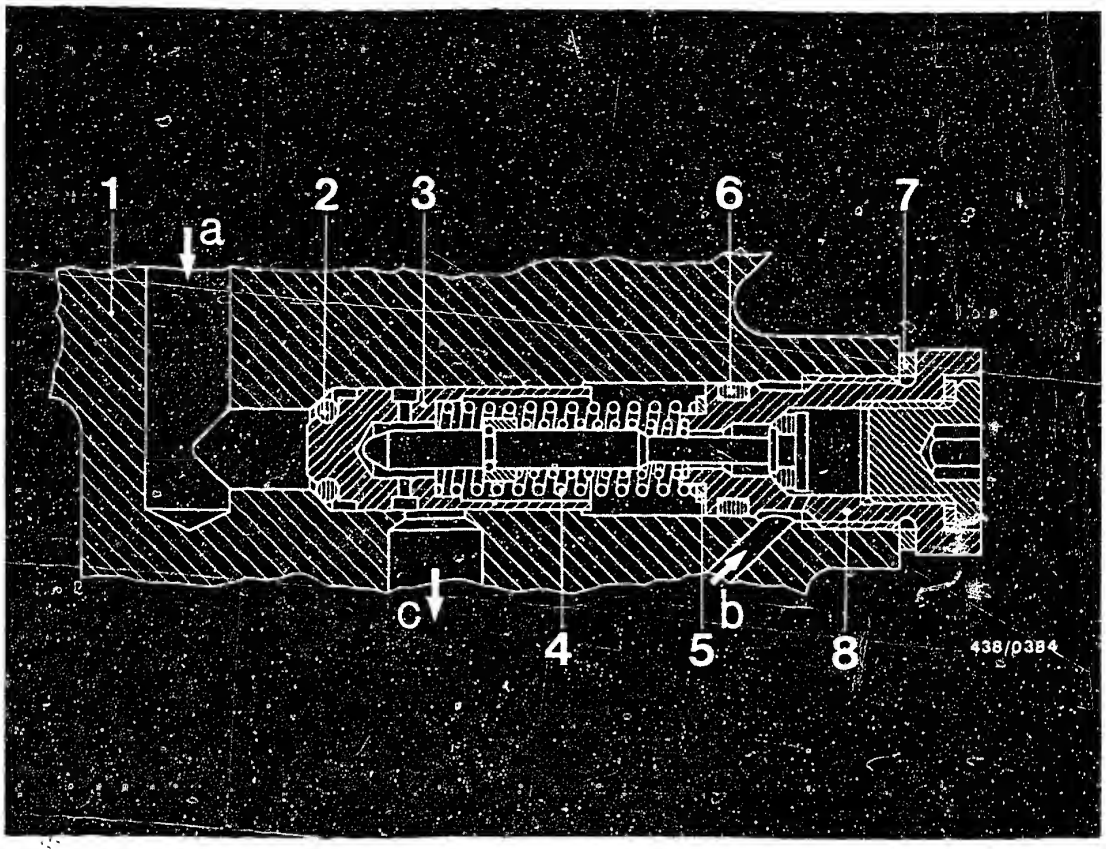
Hold start valve in a suitable container (e.g. graduate).
Switch on the electric fuel pump by bridging the electrical safety circuit.
Dry off the nozzle of the cold-start valve.
No drops must fall from the nozzle of the start valve within the next minute. Even when shaken and knocked, the start valve must not leak.
Switch the electric fuel pump off again.
Replace the cold-start valve if leaky.
Finally, perform the idle adjustment with engine at normal operating temperature.
Idle adjustment is described on Coordinate F 3.



a = Primary pressure
c = Fuel return
1 = Fuel-distributor housing
2 = O-ring
3 = Control piston
4 = Control spring
5 = Shim(s)
7 = Flat seal ring
8 = Screw plug

- Seal ring (O-ring) on control piston of primary-pressure regulator leaking.

Diagram shows fuel distributor 0 438 100 005 (without push valve)



a = Primary pressure
b = From warm-up regulator
c = Fuel return
1 = Fuel-distributor housing
2 = O-ring
3 = Control piston
4 = Control spring
5 = Shim(s)
6 = O-ring
7 = Flat seal ring
8 = Screw plug

- Diagram shows fuel distributor with push valve

Replace the seal ring.
Clean the fuel distributor in the region of the primary-pressure regulator.

Unscrew the large screw plug (8) with complete push valve. Also remove shims (5), control spring (4) and control piston (3).

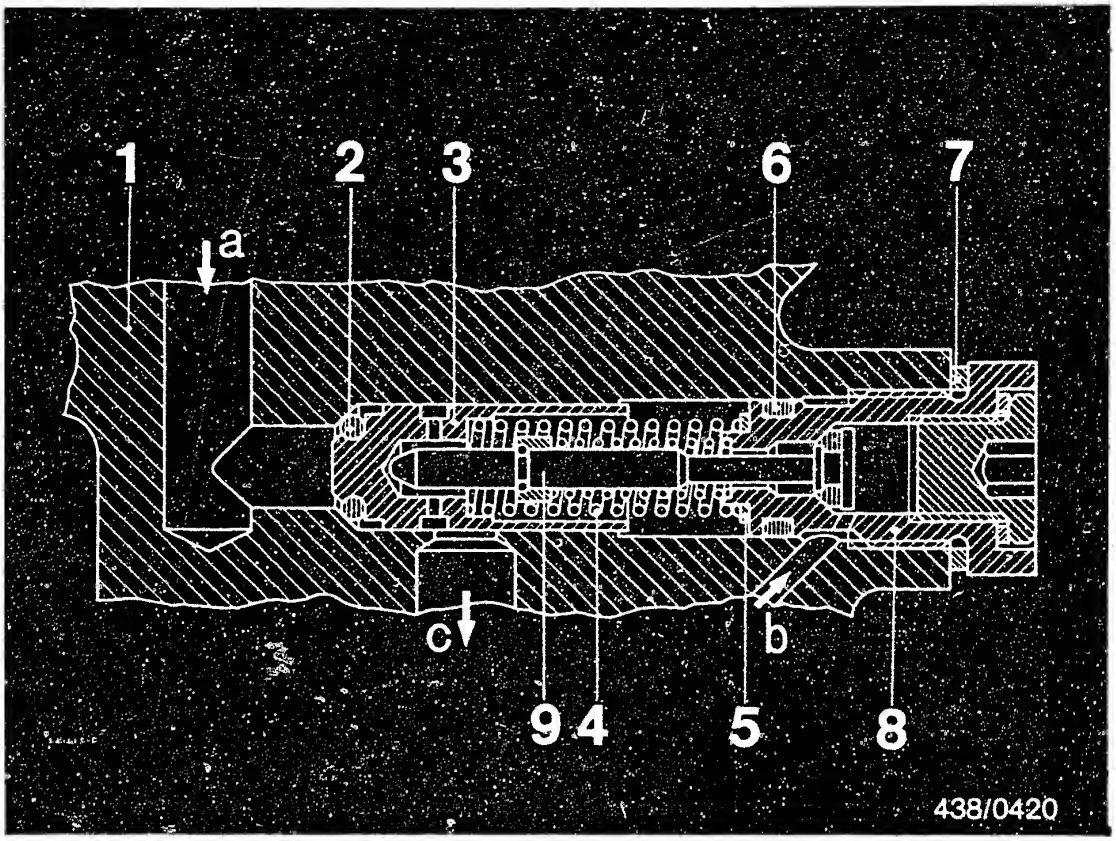
Replace seal ring (O-ring) (2) on control piston. Install control piston and control spring.

Screw in screw plug with complete push valve and with shims (as found when removing) and new seal ring (6 and 7).

Finally, check the primary pressure and adjust, if necessary, by changing the shims (5).

Test specifications and settings for primary pressure (gauge pressure)

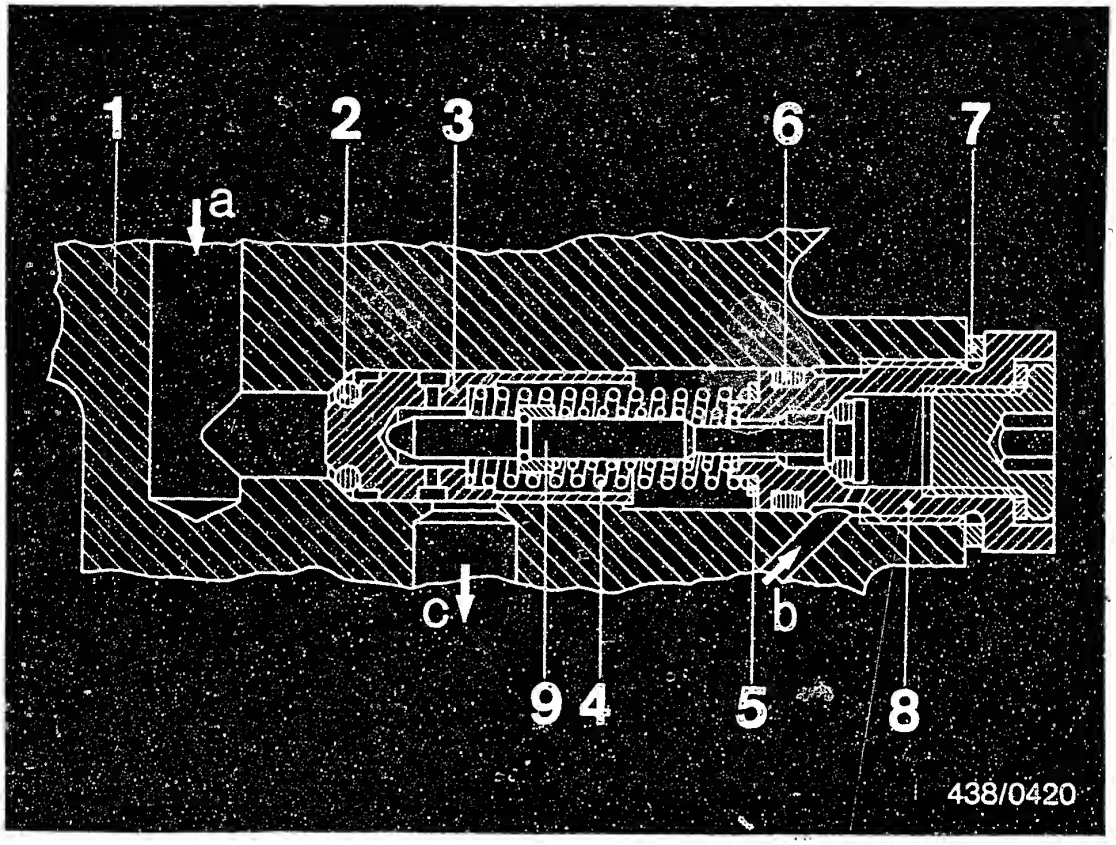
Fuel distributor no.:	0 438 100 005 0 438 100 022/023	
Checking value:	4.5...5.2 bar	(4.6...5.3 kgf/cm²)
Setting value:	4.7...4.9 bar	(4.8...5.0 kgf/cm²)
Fuel distributor no.:	0 438 100 059/061/079 0 438 100 082/100	
Checking value:	4.7...5.4 bar	(4.8...5.5 kgf/cm²)
Setting value:	4.9...5.1 bar	(5.0...5.2 kgf/cm²)



a = Primary pressure
b = From warm-up regulator
c = Fuel return
1 = Fuel-distributor housing
2 = O-ring
3 = Control piston
4 = Control spring
5 = Shim(s)
6 = O-ring
7 = Flat seal ring
8 = Screw plug
9 = Push valve

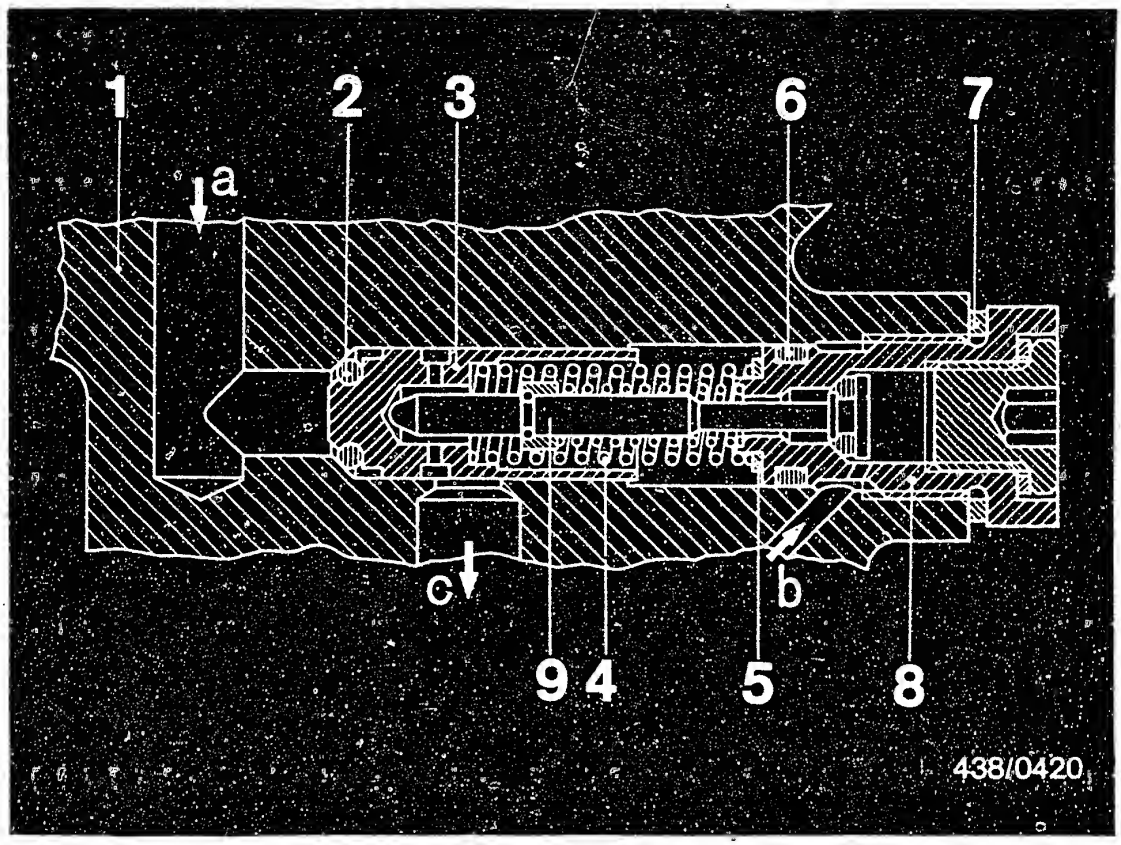
16.5 Possible cause of trouble in control-pressure circuit

- Vehicles with fuel distributor 0 438 100 005 do not have a push valve for sealing the warm-up regulator return.
  In the case of leaks in the control-pressure circuit the warm-up regulator is the cause.
  Replace the warm-up regulator.



a = Primary pressure
b = From warm-up regulator
c = Fuel return
1 = Fuel-distributor housing
2 = O-ring
3 = Control piston
4 = Control spring
5 = Shim(s)
6 = O-ring
7 = Flat seal ring
8 = Screw plug
9 = Push valve

- In vehicles with a push valve integrated in the primary-pressure regulator of the fuel distributor, this push valve seals the warm-up regulator return. In the case of leaks in the control-pressure circuit the push valve is the cause. Replace the push valve.



The seal ring of the push-up valve is permanently vulcanized to the valve needle.

For this reason, in case of leaks it is necessary to replace the complete push-up valve (fully assembled unit).

Clean the fuel distributor in the vicinity of the primary-pressure regulator. Unscrew the large screw plug (8) together with the complete push-up valve. Pay attention to the spring (4) and the shim (5).

Screw in a new push-up valve (with the same number of shims (5) as in the old valve), with new seal ring (6) and flat seal ring (7).
Finally check the primary pressure again and, if necessary, reset by replacing the shims (5).

Primary-pressure test and setting values (gauge pressure)

Fuel distributor: 0 438 100 022/023
0 438 100 005

Test specification: 4.5...5.2 bar (4.6...5.3 kgf/cm²)
Setting value: 4.7...4.9 bar (4.8...5.0 kgf/cm²)

Fuel distributor: 0 438 100 059/079/061/079
0 438 100 082/100

Test specification: 4.7...5.4 bar (4.8...5.5 kgf/cm²
4.9...5.1 bar (5.0...5.2 kgf/cm²)

17. Testing the injection valves:

Remove the injection valves for testing.
When loosening the fuel lines, apply counter-force at the fixed hexagon of the injection valves.
When refitting the injection valves, it is best to replace the O-rings on the valve stem (Part No. 3 430 210 600) in order to prevent leaks and thus the entry of unmetered air. Also check the insulating sleeves for leaks. If necessary, tighten using an Allen wrench (AF = 12 mm).

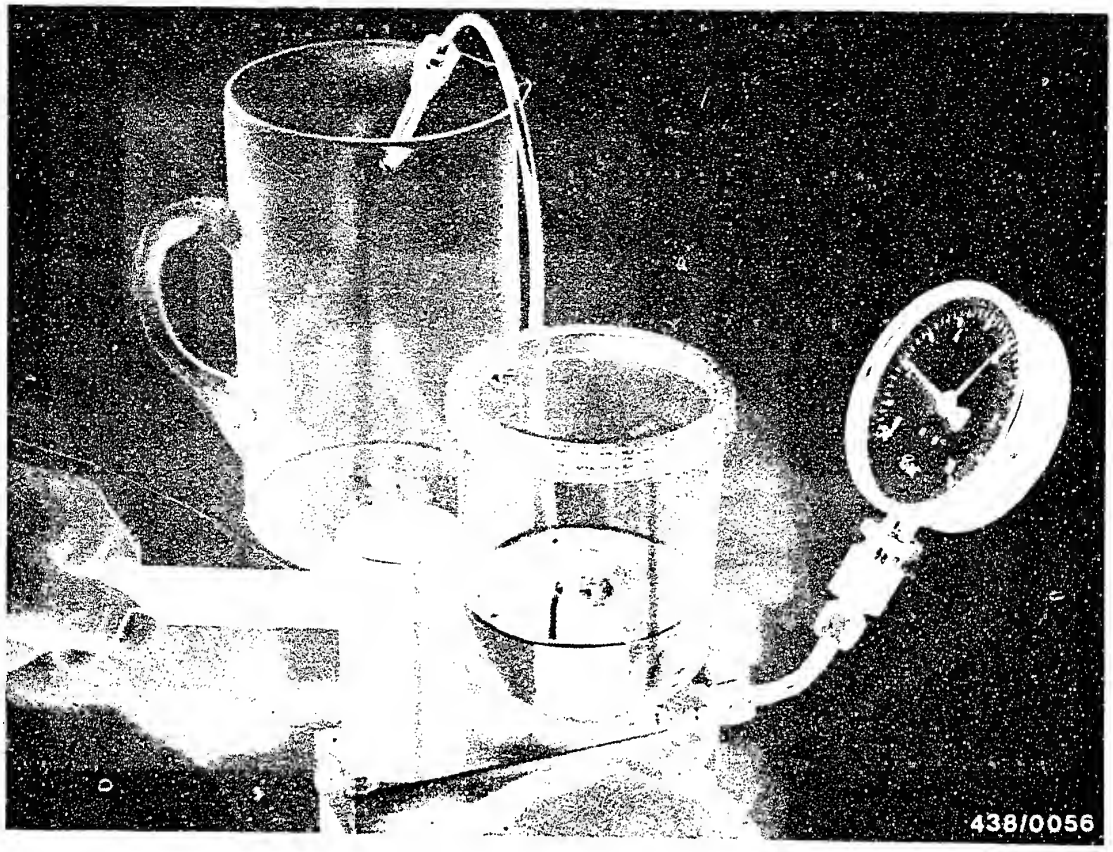
17.1 Test equipment and test media

The following testing specification refers to valve testers KDJE-P400 (previously KDEP 7452) and 0 681 200 700.

Observe the test-media specification!

Test media: Calibrating fluid (Shell K 30, Esso-Varsol, Shell Mineral **Spirits** 135)
or
Bosch Part No. VS 14 942-CH
Former Part No. 5 973 340 650
The calibrating fluid can be obtained in 5 l metal cans from the following supplier:
Firma
Oskar Gnamm GmbH & Co
D-7531 Kämpfelbach-Bilfingen

Caution:
For safety reasons, never use normal gasoline or similar easily inflammable and combustible liquids. Even with calibrating fluid, be sure to observe the local official regulations.



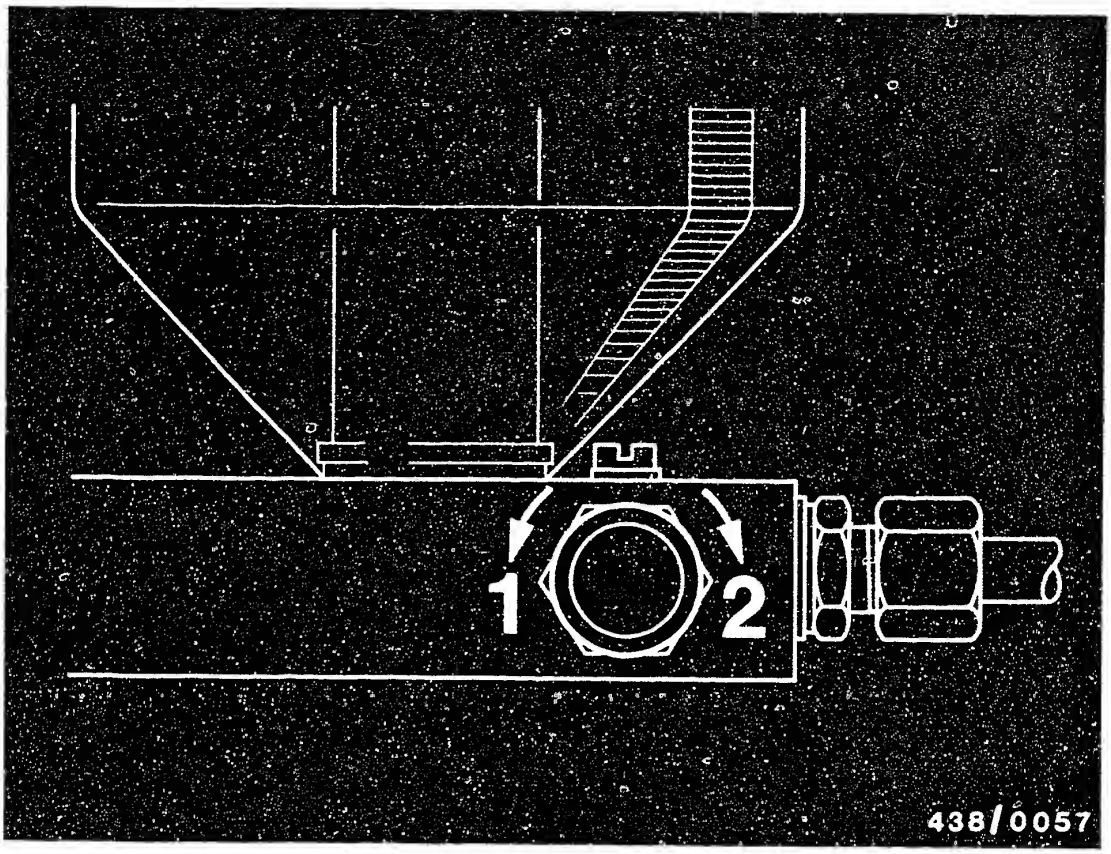
17.2 Connecting the injection valve to the tester

Remove injection valve for testing, connect to valve tester and bleed the discharge tubing by moving the lever back and forth several times with the union nut open. Then tighten the union nut.

17.3 Checking for dirt

Move the hand lever slowly (about 2 seconds per stroke) back and forth with the stopcock on the pressure gauge open. If the pressure does not build up to 1...1.5 bar gauge pressure, the injection valve has a bad leak (caused, for example, by dirt stuck in it).

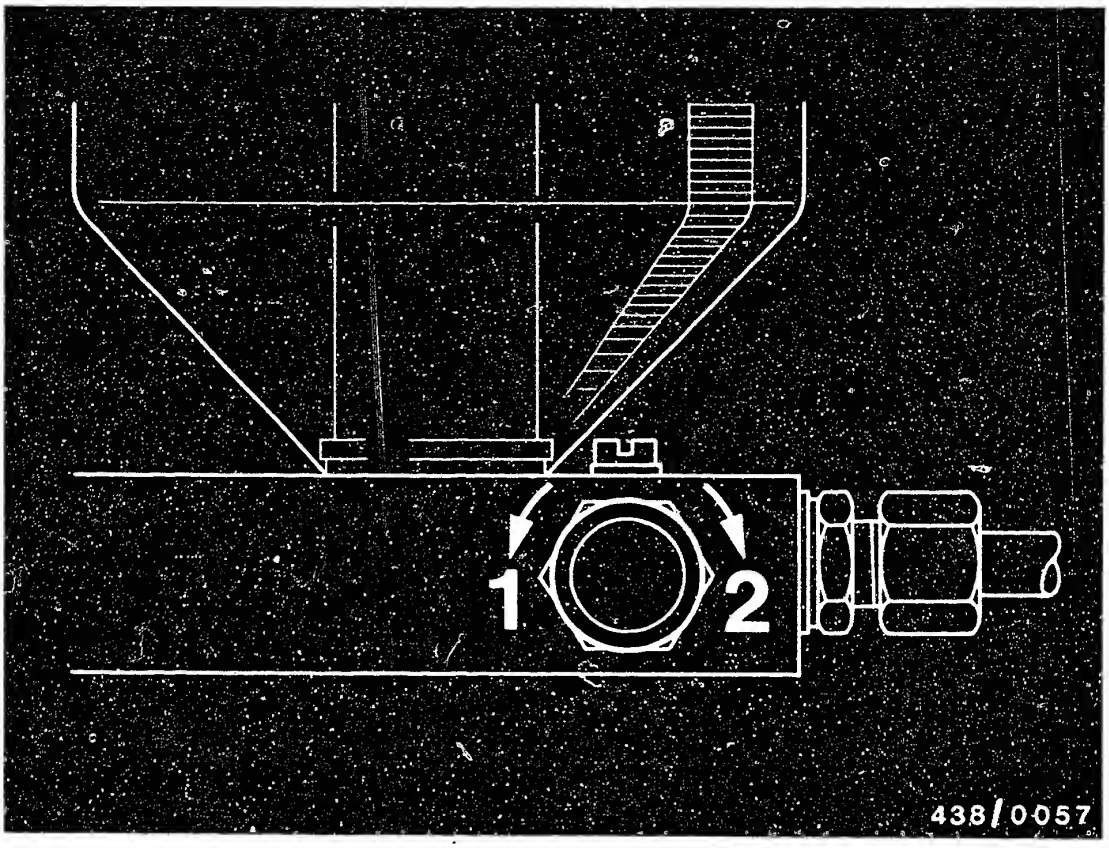
You can try to flush the injection valve clear by moving the lever back and forth several times strongly.
If this attempt is successful continue the test. If it is not possible to flush the valve clear, replace it.



1 = Open 2 = Close

17.4 Testing the opening pressure

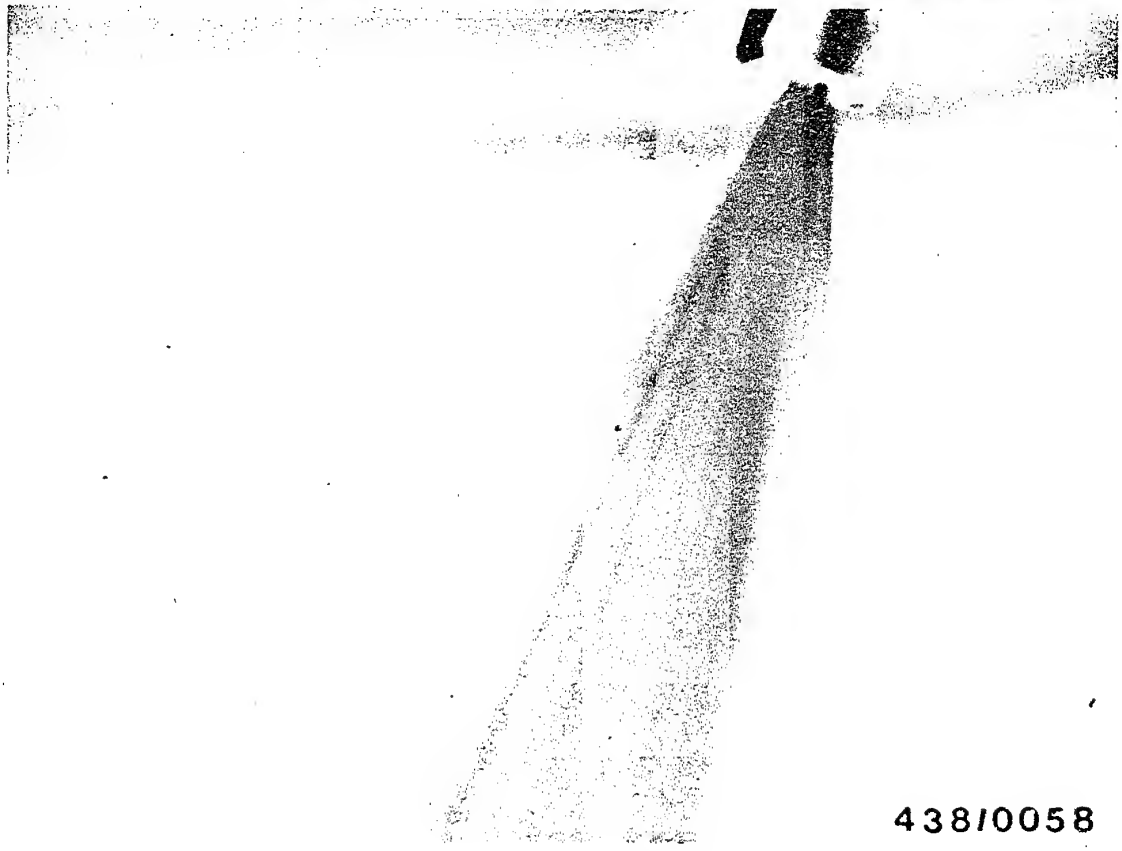
Injection valve	Test specifications - opening pressure
0 437 502 007: 0 437 502 015 0 437 502 016	2.5...3.6 bar (2.6...3.7 kgf/cm²) up to FD 828: 2.7...3.8 bar (2.8...3.9 kgf/cm²) from FD 829: 3.0...4.1 bar (3.1...4.2 kgf/cm²)



With the stopcock closed, flush the valve out and bleed it with several rapid movements of the lever.
Open the stopcock and test the opening pressure by moving the lever slowly (about 2 seconds per stroke). If the opening pressure is outside tolerance, replace the injection valve. Individual valves can also be interchanged within a set.

17.5 Leakage test

Open the stopcock, build the pressure up slowly to a value 0.5 bar under the opening pressure determined previously (but not less than 2.8 bar gauge pressure), and hold it constant at that level. No drops must now fall from the valve for the next 15 seconds.



438/0058

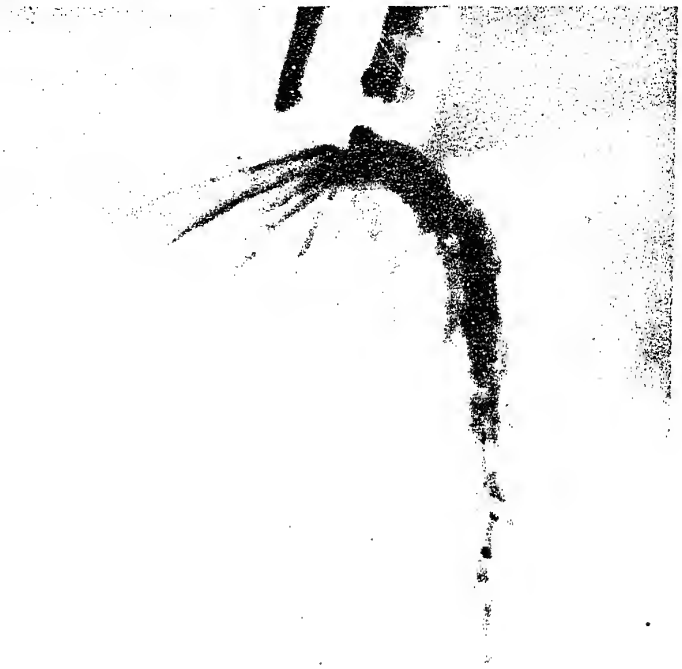
17.6 Chatter test, evaluation of spray

Move the lever back and forth at about 1 stroke per second. As this is done, the valve must chatter. No drops of fuel must form at the mouth of the valve. The valve must not produce a "cord spray". Formation of a single-sided, atomized spray within an overall spray angle of about 35^{o} is permissible (see example given in illustrations).

Illustration shows good spray formation.

438/0059

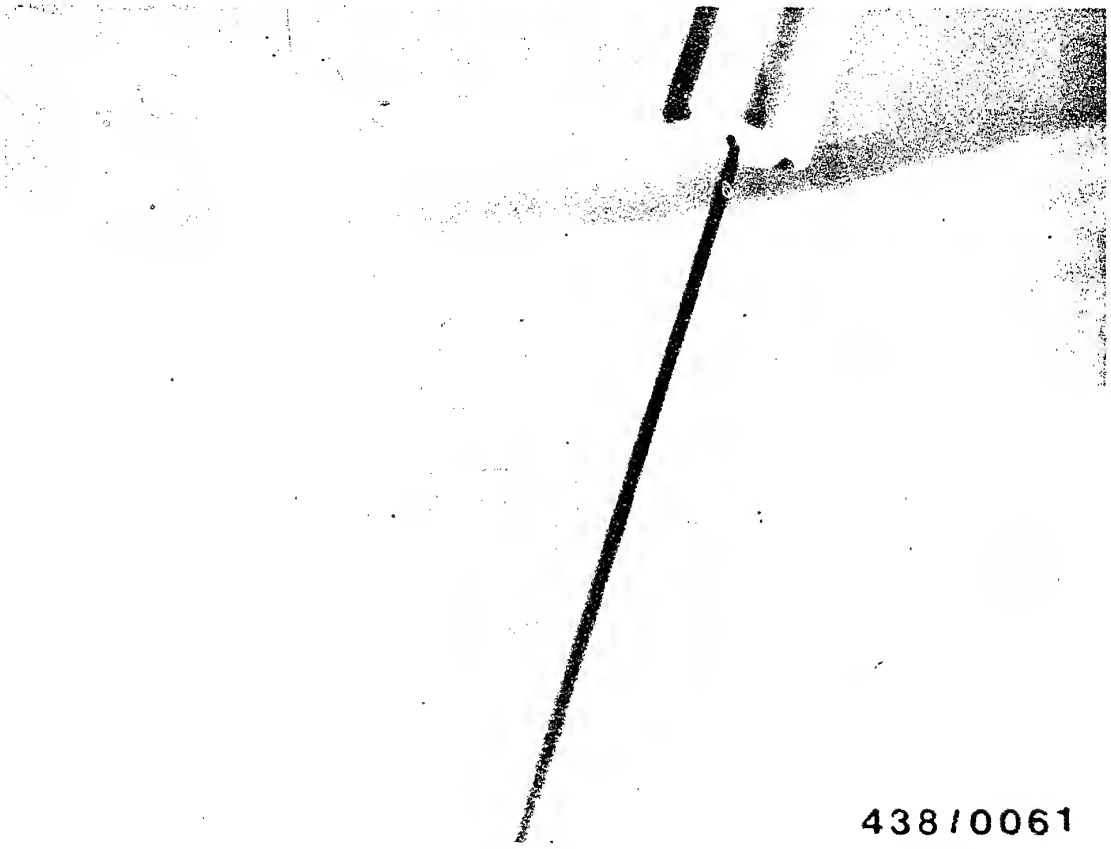
Illustration shows single-sided but nevertheless good spray formation.



438/0060

Poor spray formation; replace injection valves.

Illustration shows drop formation.



438/0061

Poor spray formation; replace injection valves.

Illustration shows "cord" spray.

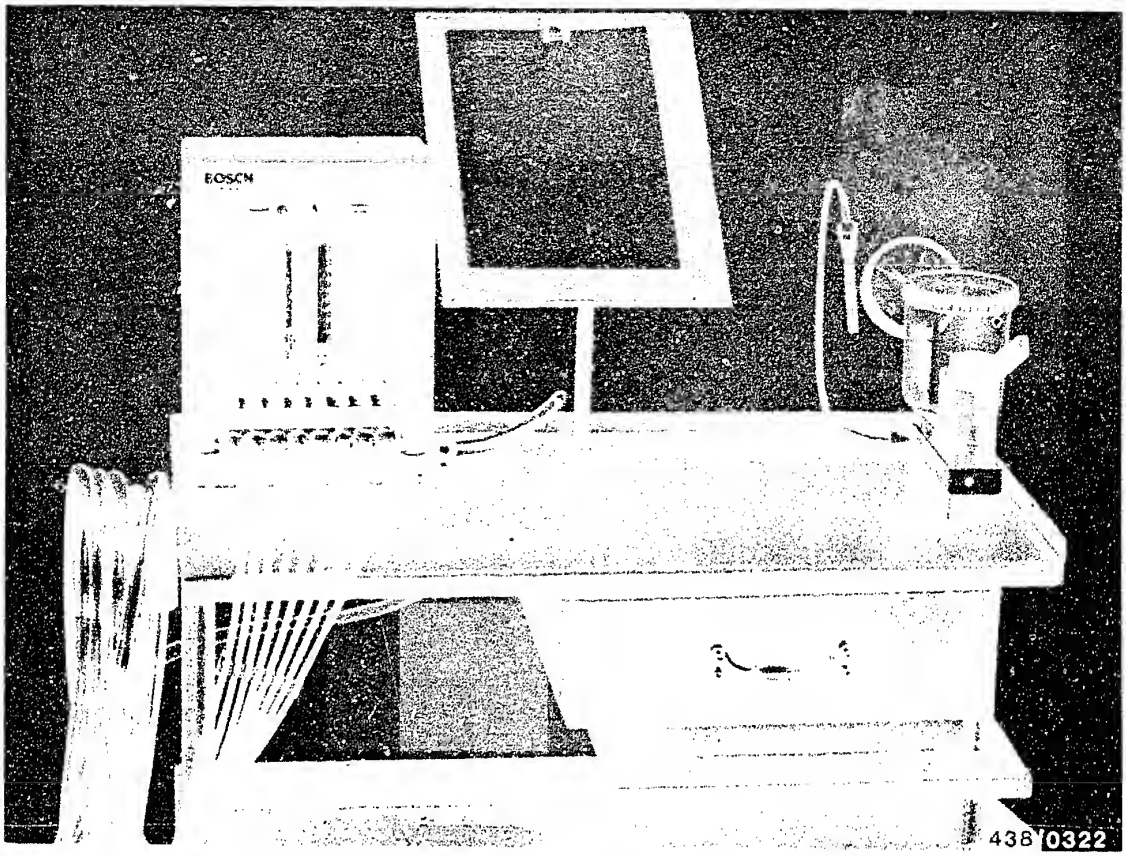
438/0062

Poor spray formation; replace injection valves.

Illustration shows "spray in strands".

If defective injection valves have been replaced, it is necessary finally to adjust the idle speed with the engine at normal operating temperature.

Idle-speed adjustment is described on Coordinates F 3.



18. Comparative measurement of fuel delivery of fuel distributor outlets.

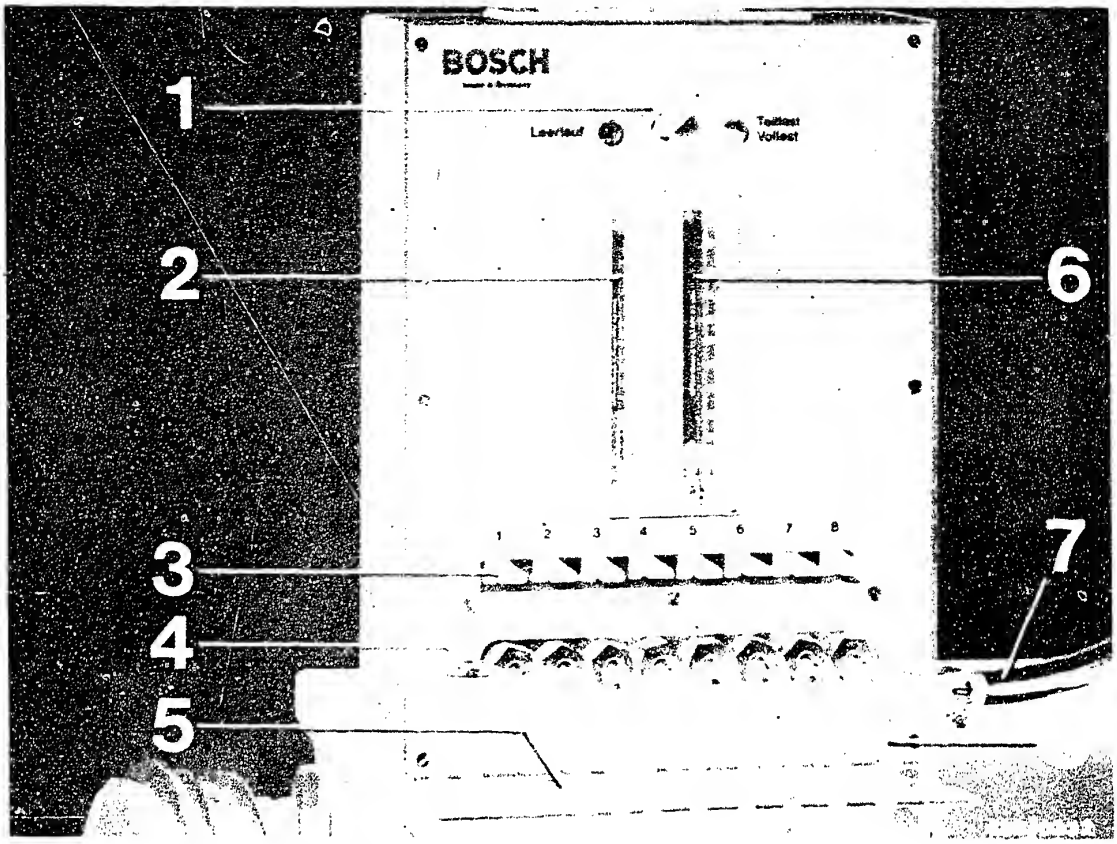
This test is carried out using the tester for delivered quantity comparison KDJE-P200 (previously KDJE 7451).

18.1 Application

By means of comparative measurements, the differences in the amounts of fuel delivered from the individual outlets on the fuel distributor are determined.

The tester is designed so that the test can be made on the vehicle without having to remove the fuel distributor.

Since the test is made with the original injection valves, the operator can recognize at the same time whether delivered-quantity scatter, if it occurs, is caused by the fuel distributor or by the injection valves.



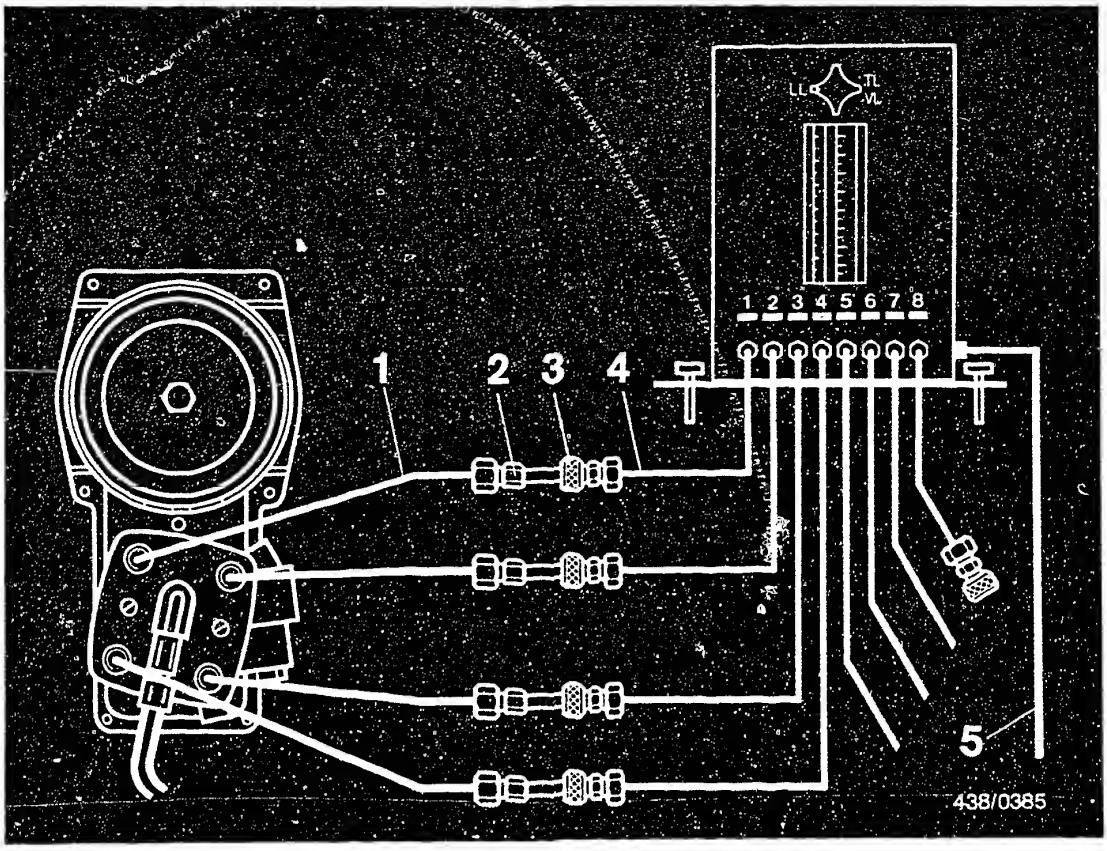
1 = 3-way cock
2 = Small rotameter tube
3 = Keyboard for 8-way valve
4 = Adjusting screw for setting up
5 = Spirit level
6 = Large rotameter tube
7 = Return hose
8 = Polyamide hose lines (test lines)

18.2 Construction

The tester is designed for use with all engines, up to 8 cylinders, equipped with K-Jetronic.

Basically, the tester consists of a steel housing containing 2 rotameter tubes with measuring ranges of 2...15 cm^3 and 10...180 cm^3, an 8-way valve for key operation (3) and a 3-way stopcock (1).
The small rotameter tube (2) is used for the idle measurement while the large tube (6) is used to measure the fuel delivery at part and full-load. The particular rotameter tube to be used is connected by means of the 3-way stopcock. Using the 8-way valve, the fuel delivery of each cylinder is tested one after the other.

Attached to the tester are 8 hoses (8), each terminated with an automatic connector. When the injection valves are withdrawn from their sockets on the engine they are attached to these connectors. Each automatic connector is fitted with a push valve so that no fuel can escape from connectors that are not in use (when 4- or 6-cylinder systems are tested).
The fuel is returned to the fuel tank through a hose (7) about 5 m long.
The entire test is made with a closed circuit, i.e. no fuel escapes.



1 - Fuel-injection tubing of fuel distributor
2 - Injection valves
3 - Automatic connectors
4 - Tester hoses
5 - Return line to fuel tank filler neck

18.3 Setting up and connecting the tester:

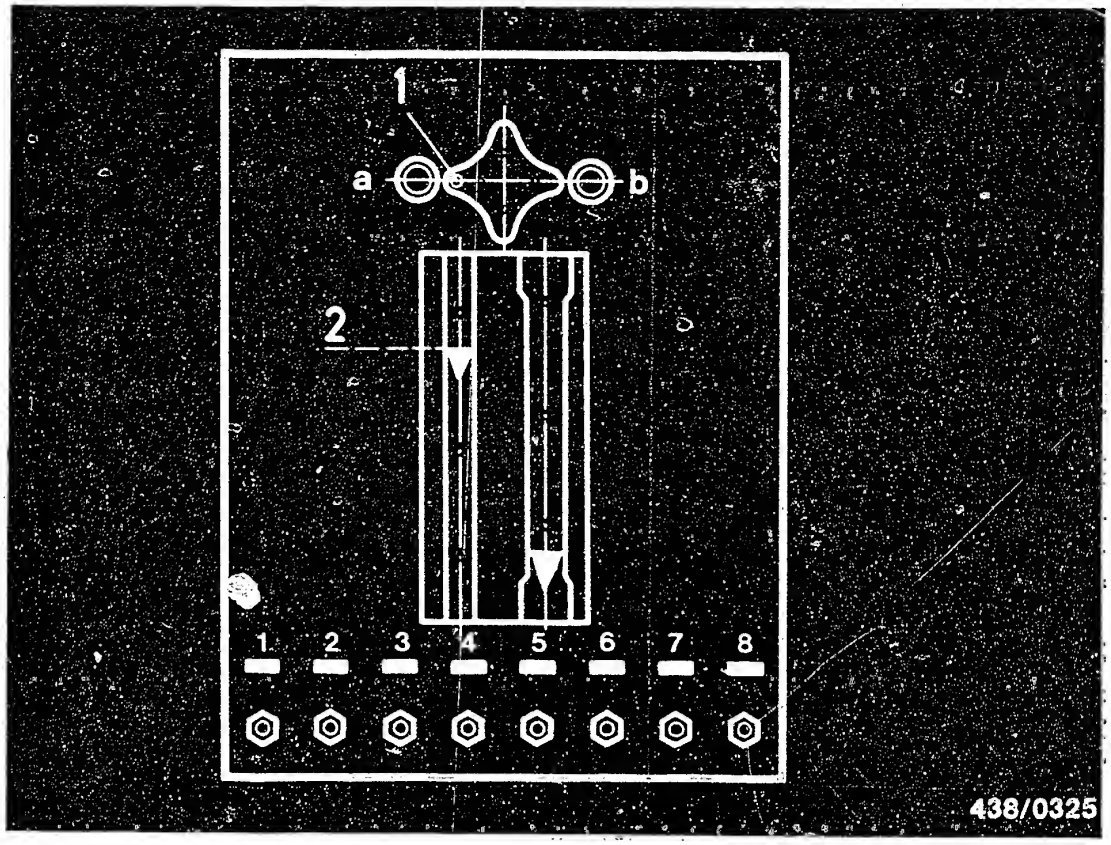
Set the tester up beside the vehicle on a solid base (e.g. on tester trolley KDJE-W 100) and align it with the built-in spirit level (water level at base of the tester).

Remove injection valves; the injection tubing remains connected.
Clean the injection valves with a rag and insert injection valves in correct sequence into the automatic connectors of the first four tester hoses.

Note:
Insert the injection valves as far as they will go and tighten the knurled thumbscrews well so that the non-return valves of the automatic connectors are open fully.
Introduce the return hose of the tester into the fuel tank filler neck.

18.4 Bleeding the tester:

Remove the rubber hood (loosen 2 clamping bands) so that air-flow sensor plate becomes accessible.
Remove the electric plugs from the warm-up regulator and the auxiliary-air device.
Switch on the electric fuel pump by bridging the electrical safety circuit.
Raise the air-flow sensor plate to the stop.
Press the keys on the 8-way valve one after the other, while simultaneously switching the 3-way stopcock until both rotameter tubes are bled.
Return the sensor plate to the rest position.



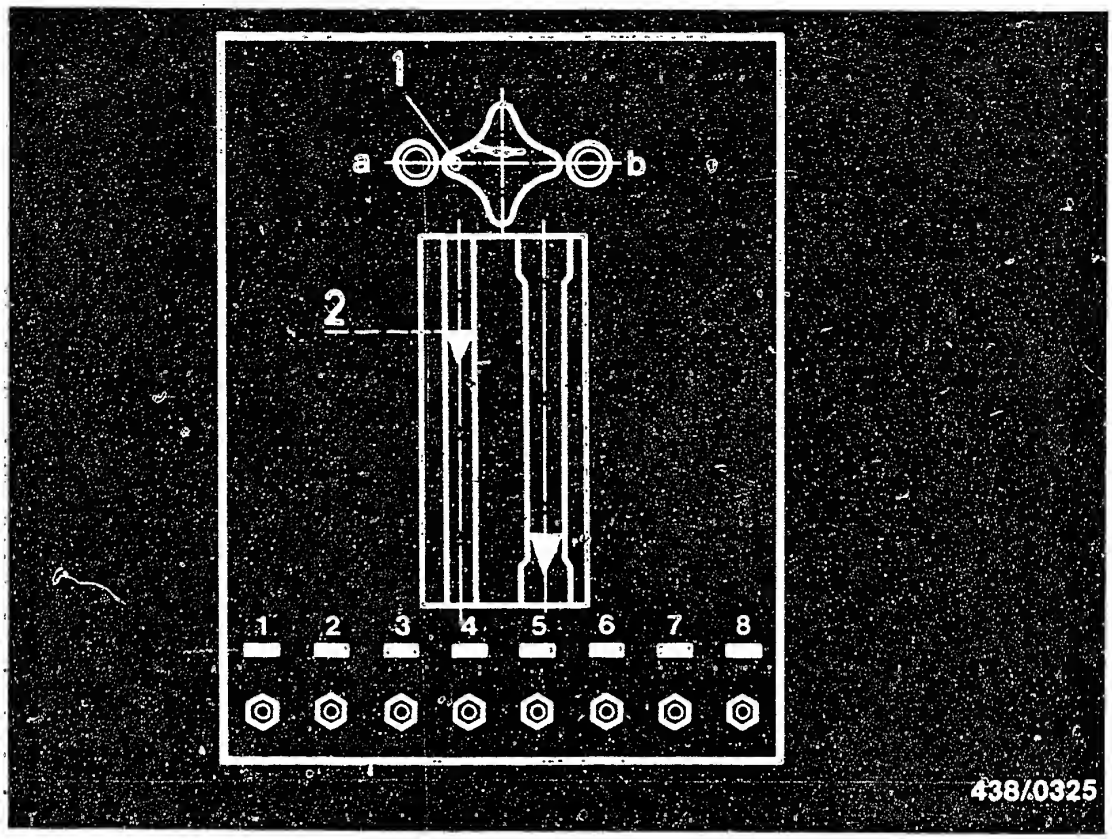
a = Idle
b = Part load/full load

1 = White dot
2 = Measuring line

18.5 Testing:

The flow comparison measurement is made in the idle, part-load and full-load ranges.

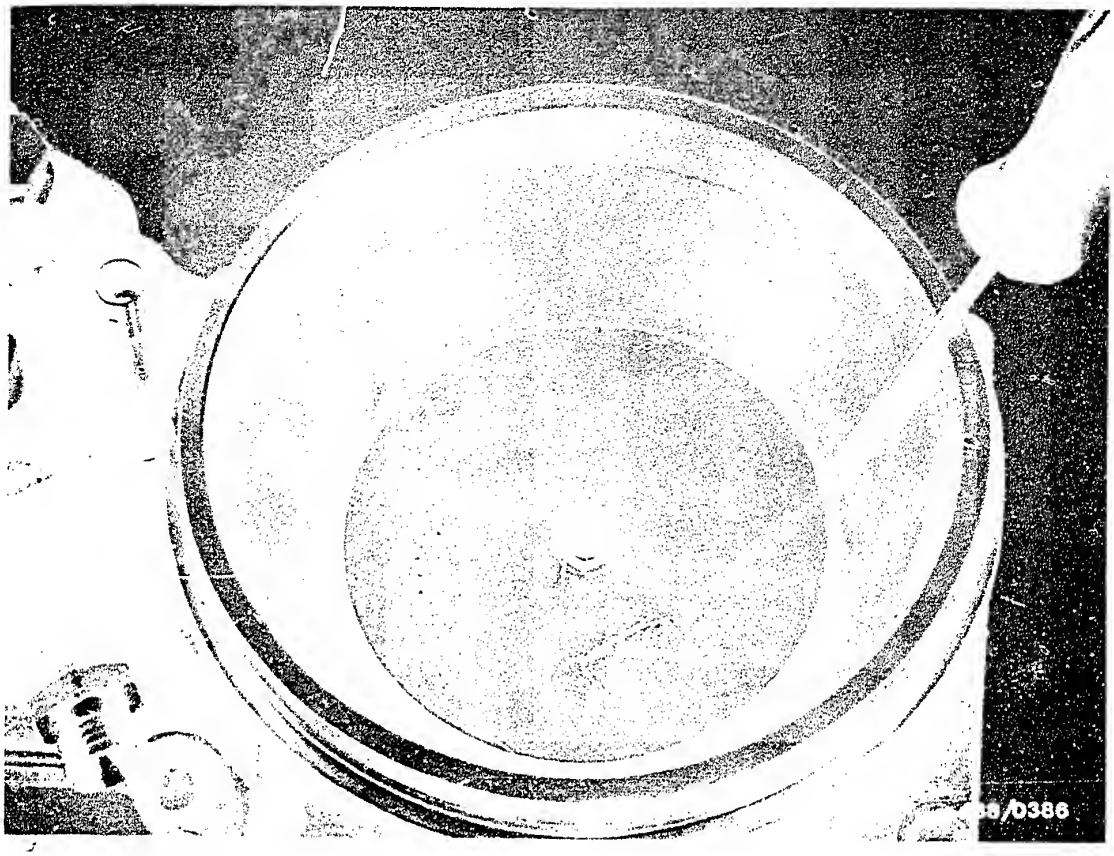
The small rotameter tube is to be used for the idle measurement (white dot to left on control knob); part-load and full-load measurements are made using the large rotameter tube (white dot to right).



1 = White dot
2 = Measuring line

a = Idle
b = Part load/full load

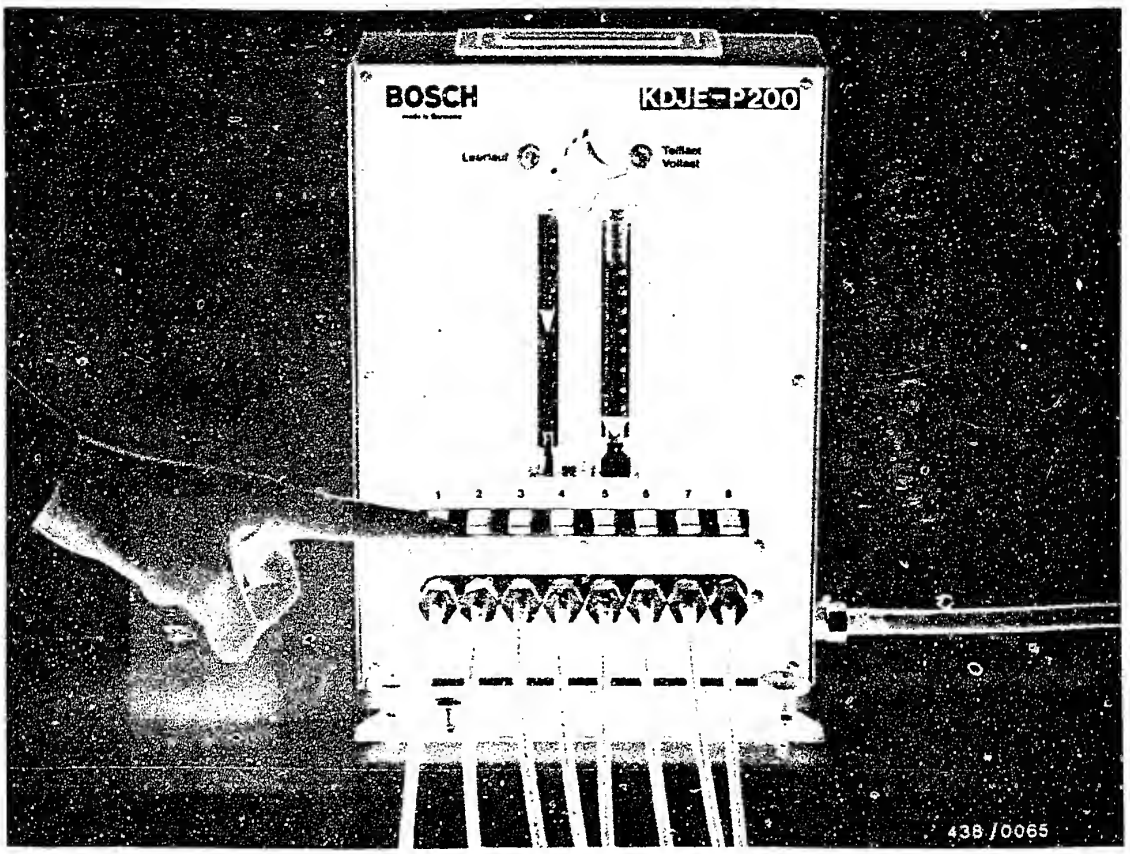
The delivered quantities indicated on the rotameter tubes are read off at the top edge of the conical float (Item 2).
On testers with a ball float the uppermost point of the ball is used for reading off. With each measurement be sure to wait until the float has reached its final position. This may take 20...30 seconds in the case of small deliveries.



The exact setting and locating of the position of the air-flow sensor plate for the various load ranges is done using a screwdriver (a small one for the idle-position), which is inserted to an appropriate depth between the air funnel and air-flow sensor plate.

Procedure:

Switch on the electric fuel pump by bridging the electrical safety circuit.
Fixed numerical values are specified in the following test section for the maximum permissible fuel delivery differences for the individual load ranges.
The "set-point" value always pertains to the fuel-distributor outlet with the lowest fuel delivery, i.e. in each case the outlet with the lowest delivery is to be first ascertained.



Press the key for outlet 1. Pivot the air-flow sensor plate until the corresponding rotameter tube approximately indicates the "set-point" value. Fix the air-flow sensor plate in this position.

Test the remaining outlets in order to determine which outlet has the lowest fuel delivery.

Press the key for this outlet again, and set the delivery precisely to the "set-point" by correcting the position of the air-flow sensor plate. Then fix the air-flow sensor plate in this position again.

Press the remaining keys one after the other, and determine the maximum fuel delivery of each outlet. A deviation in fuel delivery can only be above the "set-point".

18.6 Test specifications

Fuel distributor part no. 0 438 100 005 0 438 100 023 0 438 100 059	Setting point	Max. allowable delivery
Idle	6.0 cm^3/min.	6.8 cm^3/min.
Part load	40.0 cm^3/min.	44.0 cm^3/min.
Full load	160.0 cm^3/min.*	175.0 cm^3/min.

Fuel distributor part no. 0 438 100 022 0 438 100 079	Setting point	Max. allowable delivery
Idle	6.0 cm^3/min.	6.7 cm^3/min.
Part load	40.0 cm^3/min.	43.0 cm^3/min.
Full load	160.0 cm^3/min.*	175.0 cm^3/min.

Fuel distributor part no. 0 438 100 061	Setting point	Max. allowable delivery
Idle	6.0 cm^3/min.	6.6 cm^3/min.
Part load	40.0 cm^3/min.	43.0 cm^3/min.
Full load	120.0 cm^3/min.*	131.0 cm^3/min.

Fuel distributor part no. 0 438 100 082 0 438 100 100	Setting point	Max. allowable delivery
Idle	6.0 cm^3/min.	6.6 cm^3/min.
Part load	40.0 cm^3/min.	43.0 cm^3/min.
Full load	110.0 cm^3/min.*	120.0 cm^3/min.

* This full-load delivery must be obtained at least with maximum deflection of the air-flow sensor plate.
If not, replace the fuel distributor.

If, in testing, a too large difference is ascertained in one of the three load ranges, the test should for safety's sake be repeated.
If the result is confirmed, you should check whether the fault lies in the fuel distributor or in the injection valves.
To do this interchange the injection valves with the greatest and smallest difference.
If the result is still the same, the fault is in the fuel distributor. If the fault follows the interchanged injection valves, it lies in the injection valves.
Change defective fuel distributor and/or replace defective injection valves.

18.7 Final operations

Check the seal rings on the stem of the injection valves for damage and deformation. If necessary, use new seal rings (Part No. 3 430 210 600).

Also check the insulating sleeves. If necessary, tighten with an Allen wrench (AF = 12 mm).

Refit the injection valves properly.
Also mount the rubber hood. Make sure that all lines are laid correctly.
Re-connect the electrical safety circuit of the K-Jetronic properly (re-insert relay).
Use a trial run to check that there are no leaks in the line connections.

Finally, test the idle adjustment and correct if necessary.
Idle adjustment is described on Coordinate F 3.

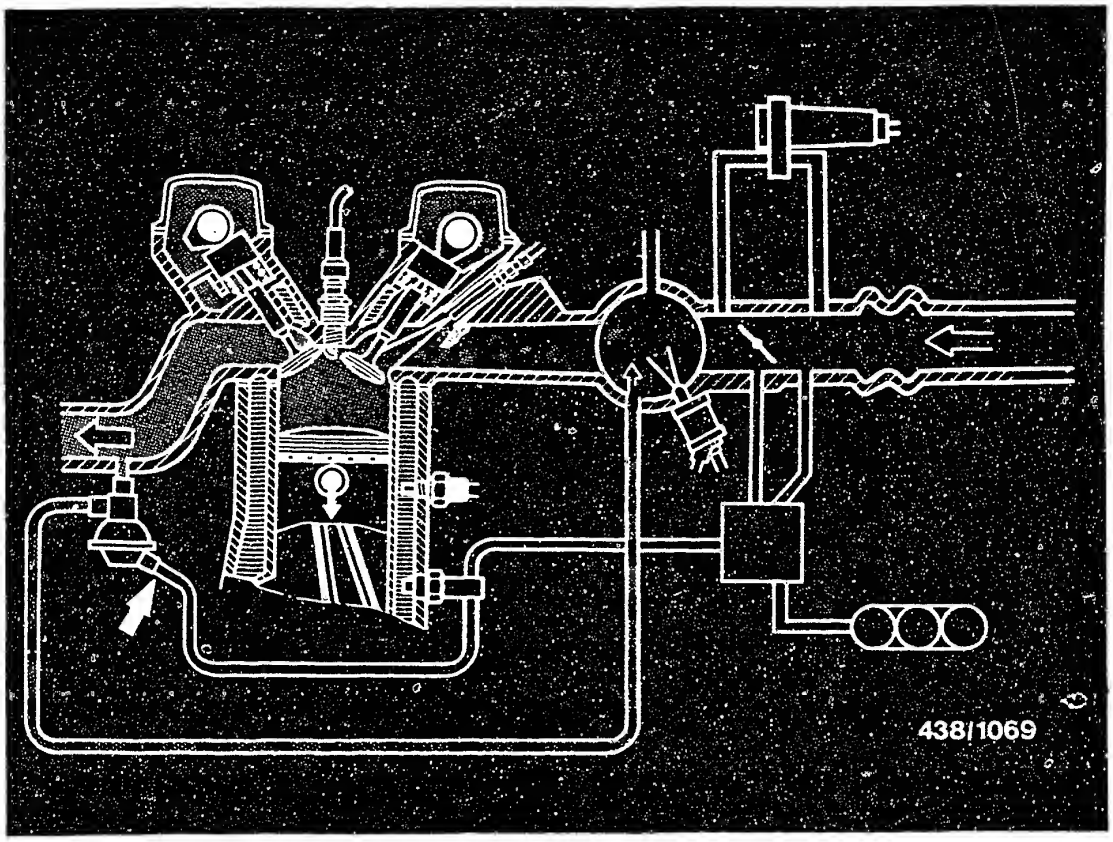
19. Idle adjustment

19.1 Test conditions:

Warm up the engine for the idle adjustment (oil temperature approx. 80°C).

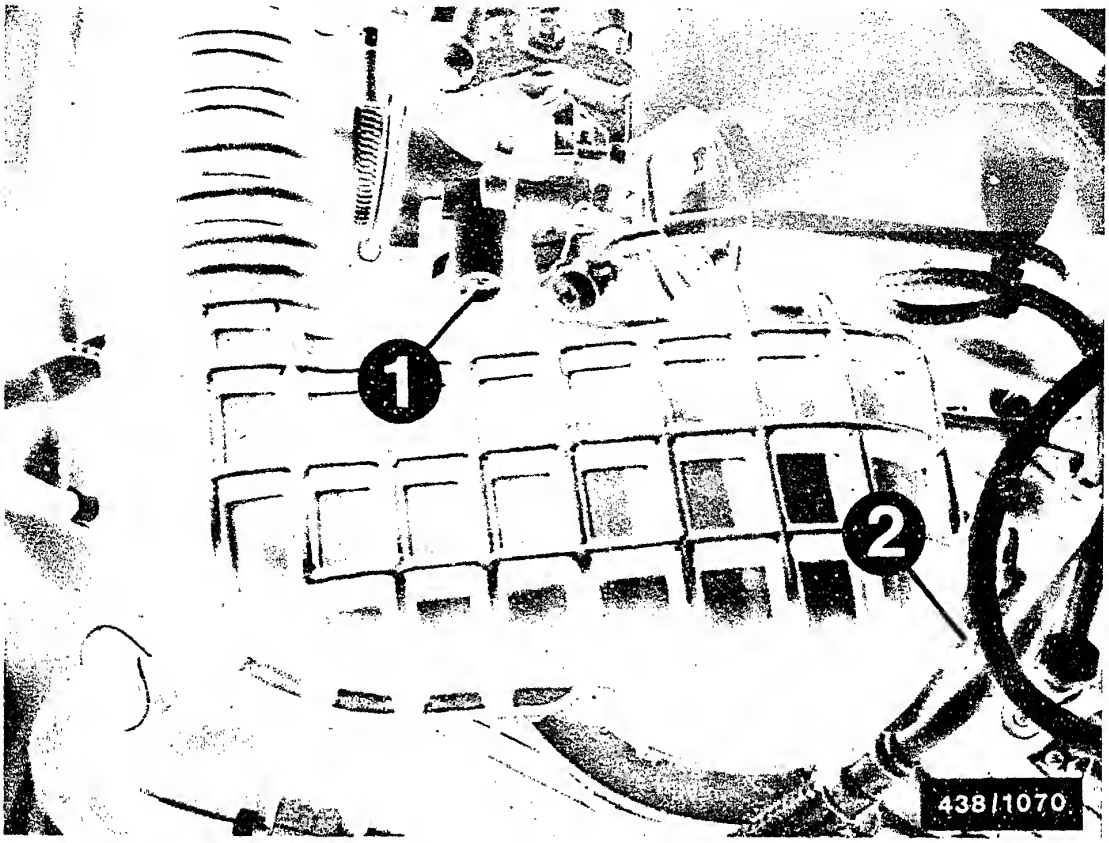
Important:

- If the fuel-injection lines or injection valves have been loosened or removed, warm up the engine under load. The low fuel throughput at idle is not always sufficient for bleeding the fuel-injection lines.
- The idle adjustment must not be performed with the engine too hot, e.g. immediately after being raced or after a power measurement on the roller-type test stand.
- Switch on upper beam (reduction in idle speed).
- Remove the crankcase ventilation hose from the cylinder head cover and seal off the end of the hose.
- In vehicles with an air conditioner, this should be switched off to stabilize the engine speed during idle adjustment.
- Before adjusting, check whether the throttle-plate lever is up against the idle stop. The cable must be adjusted so that it is free of tension.
- Engine-speed measurement with separate tachometer.



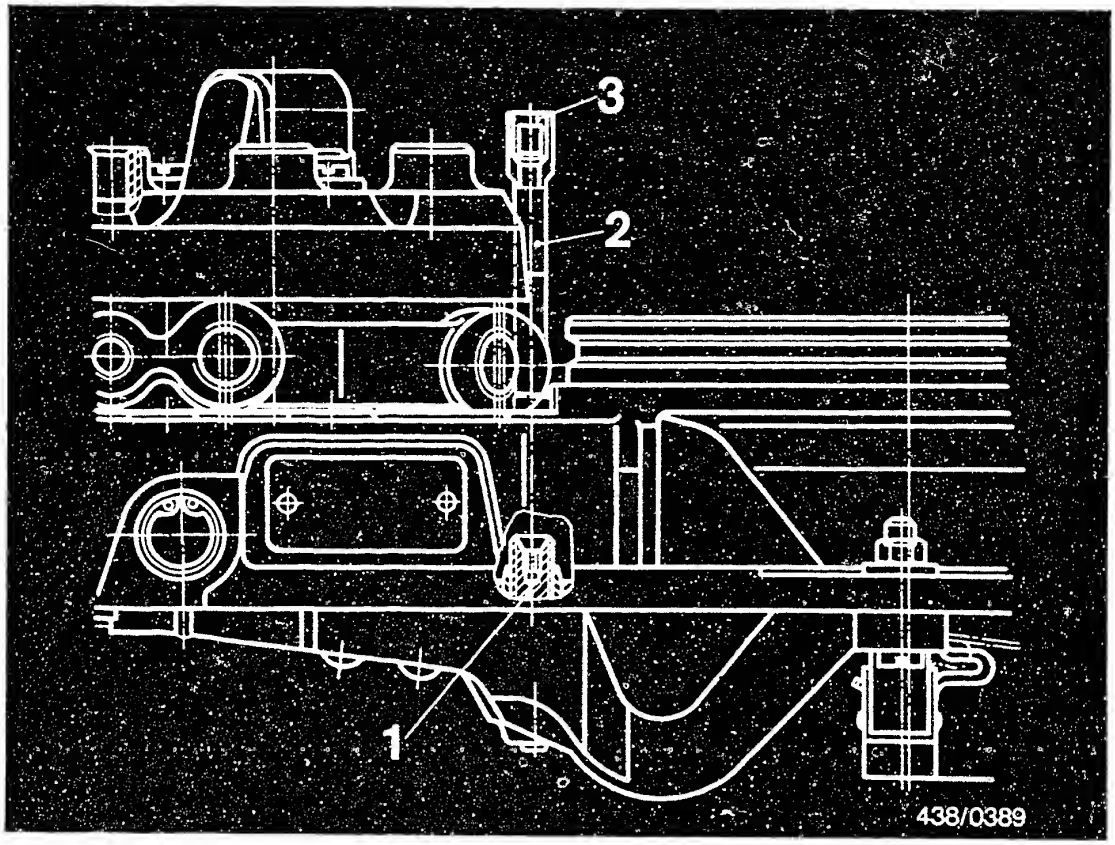
19.2 Rendering the exhaust-gas recirculation system inoperative

Concerns only vehicles of the Canada and Sweden version.
Remove the manifold-pressure hose line (arrow) from the exhaust-gas recirculation valve.
Seal off tight the end of the hose and the fitting on the recirculation valve.



19.3 Adjusting the idle speed and CO concentration

Adjust the idle speed at the bypass screw (1) on the throttle-valve assembly.
Adjust the CO concentration in the exhaust gas at the idle-mixture-adjusting screw (2) in the mixture-control unit.



Adjusting the CO concentration

The CO concentration is adjusted by turning the idle-mixture-adjusting screw (1) in the mixture-control unit using the adjusting wrench KDEP 1035.

After removing the safety cap (3) the adjusting wrench is passed through the guide tube (2) and inserted into the idle-mixture-adjusting screw.

Turning to the right = richer mixture
Turning to the left = leaner mixture

Caution:
Always make the adjustment from the lean side, i.e. if the mixture is too rich turn the idle-mixture-adjusting screw further to the left than necessary and then turn it to the right up to the setting required.

After every adjustment remove the adjusting wrench and accelerate the engine briefly, so that the air-intake system can cool off. Then wait until the indicator of the CO tester has stabilized. Never accelerate the engine with the wrench still in place as this could result in bending the control lever in the air-flow sensor.

19.4 Anti-tamper device for idle-mixture-adjusting screw

In the Federal Republic of Germany, § 47 of the FMVSS/ CUR, "Exhaust Gases and their Discharge", has been amended. This amendment order was printed in full in the Verkehrsblatt 13 of 15 th July 1975.
Accordingly, all motor vehicles with externally supplied ignition produced as of 1 October 1976 must be provided with anti-tamper devices for the idle-mixture-adjusting screw so that it is not possible to adjust the screw without destroying the anti-tamper device. The intention is to prevent non-experts from re-adjusting the idle setting and thus inadmissably influencing the exhaust gas. Consequently, the anti-tamper caps may only be used in the workshop and must not be sold to customers for their own use.
These anti-tamper caps come in different colors. The cap to be used for the after-sales service of updraft air-flow sensors is red.
It can be obtained from Bosch under part number 3 430 522 002.
The bore of the setting device (for receiving the adjusting wrench) is sealed by a plug.
Tool set for removing and fitting the idle CO anti-tamper device on the air-flow sensor:
e.g. No. 4521/7 from Hazet Co., 5630 Remscheid.

19.5 Test specifications and settings for idle adjustment:

- Conditions:

  Engine at normal operating temperature,
  Switch on upper beam, switch off air conditioner.
  Render exhaust-gas recirculation system (if fitted) inoperative.
  Remove crankcase breather hose from cylinder head cover and seal off end of hose.
  Radiator fan must not operate during adjustment.

- Idle speed

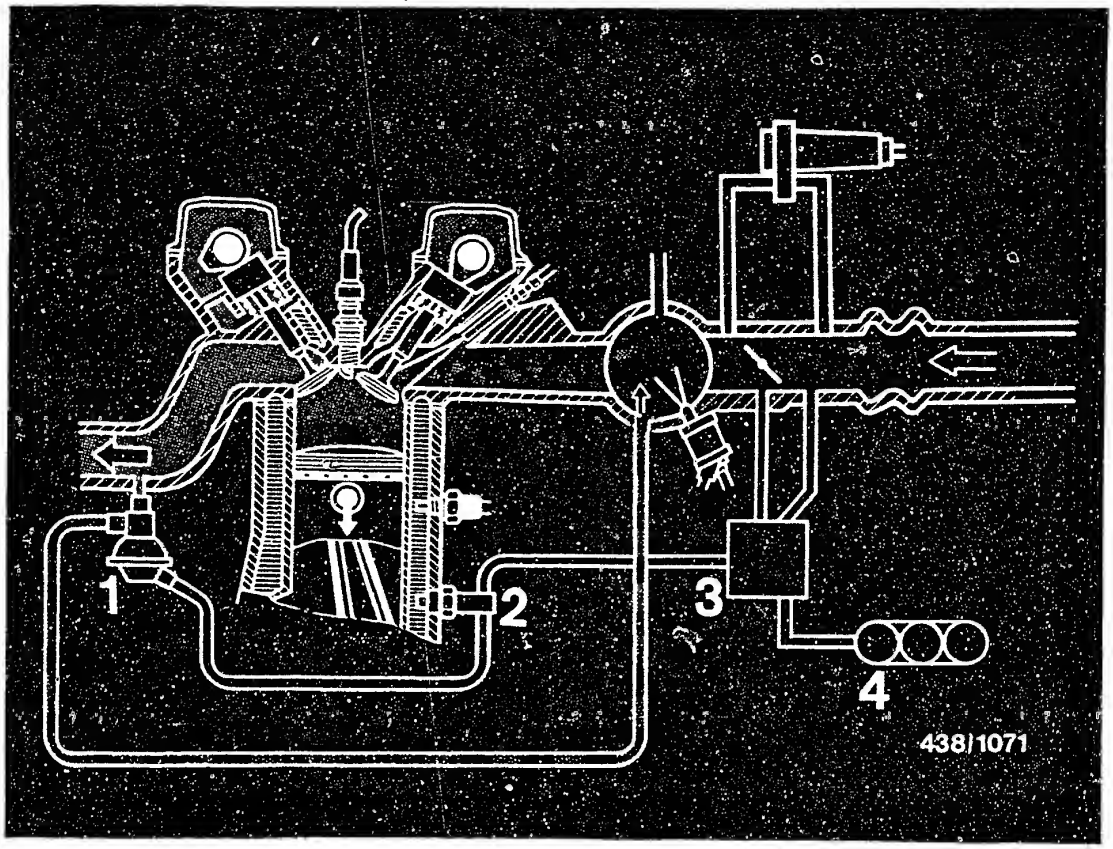
European versions:	900...1000 min^{-1}
Canada and Sweden versions:	850...1000 min^{-1}

- CO concentration: 1.3...1.7 % by vol. CO

19.6 Final operations

Reconnect the crankcase breather hose to the cylinder head cover.

Reconnect the manifold-pressure hose line of the exhaust-gas recirculation system (if fitted) to the recirculation valve.



1 = Exhaust-gas recirculation valve
2 = Thermopneumatic valve
3 = Vacuum booster
4 = Vacuum reservoir

20. Exhaust-gas recirculation (not made by Bosch)

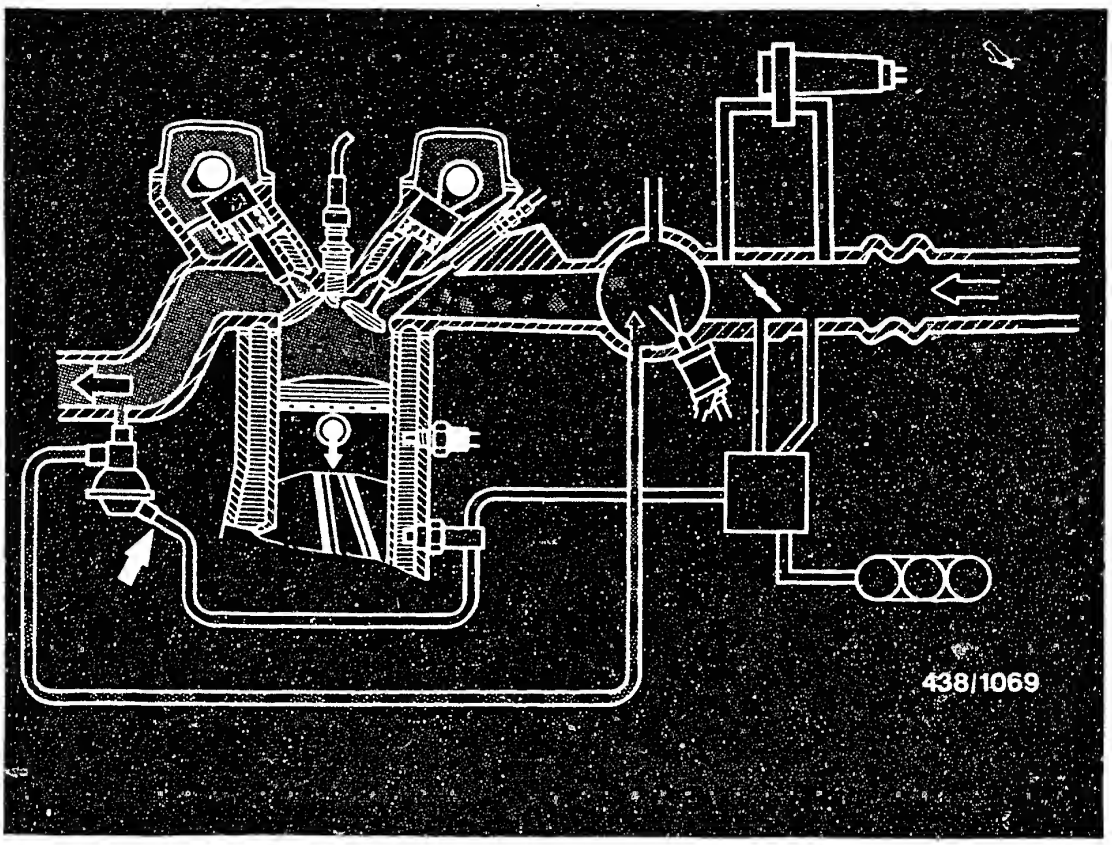
Vehicles for Canada and Sweden are equipped with exhaust-gas recirculation.

20.1 Operation

Via a vacuum-controlled recirculation valve some of the exhaust gas is recirculated to the intake manifold when the engine is warm and operating in the part-load range. The recirculation of exhaust gas into the combustion chamber lowers the combustion temperature and reduces the emission of nitrogen oxides (NOx).

The thermopneumatic valve and the position of the manifold connection port on the throttle-valve assembly guarantees that exhaust-gas recirculation is only operative when the engine is warm and operating in the part-load range.
There is a reduction in engine speed.
Exhaust-gas recirculation is not operative when the engine is idling, at full load or when the engine is cold.

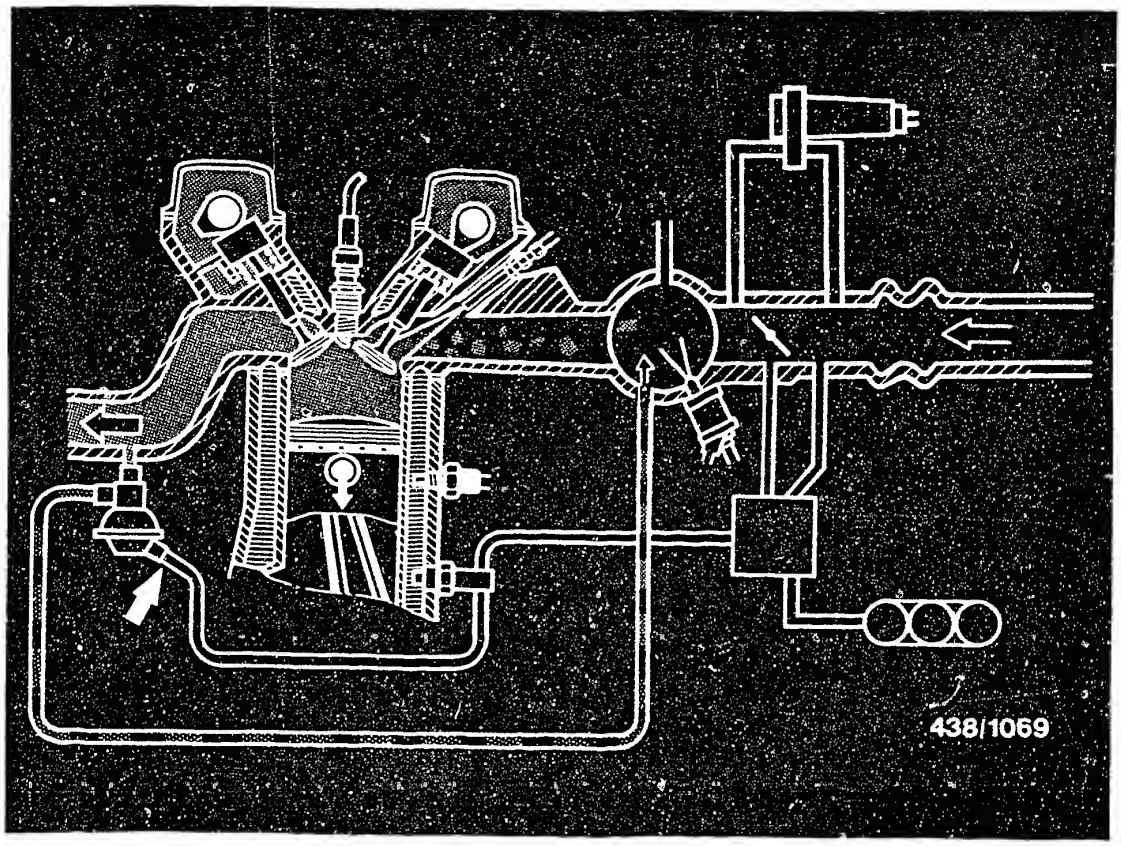
If the vehicle is operated in countries with emission legislation which does not require such systems, it is not necessary to shut down the exhaust-gas recirculation system.



20.2 Tests with the engine running

- Recirculation valve
  Remove the vacuum-control line (arrow) from the recirculation valve. Connect Mityvac hand vacuum pump and apply vacuum to the recirculation valve. There must be a clear deterioration in the running of the engine. If not, replace recirculation valve.

- Vacuum control
  Remove vacuum-control line from recirculation valve and connect Mityvac hand vacuum pump to control line. At part load there must be vacuum. At idle there must be no vacuum. Otherwise, check vacuum connection ports on throttle-valve assembly.



- Thermopneumatic valve
  Remove vacuum-control line (arrow) from recirculation valve and connect Mityvac hand vacuum pump to control line.

  At engine temperatures below + 45°C the thermopneumatic valve must be closed, and above + 61°C it must be open.

  Replace the thermopneumatic valve if defective.

After-sales Service

Technical Bulletin

Packaging of goods under warranty

438

K-Jetronic (CIS)

VDT-I-438/101 B
10. 1976

All components or assemblies of the K-Jetronic which are dispatched under warranty must be correctly and carefully packaged so that no further damage or impairments occur during transit, since these would not be covered by warranty.

Any fuel remnants must be removed from those K-Jetronic assemblies intended for dispatch, so as to eliminate any danger of fire during transit.

The intake openings and outlets of the assemblies must be sealed off with caps or plugs. As new products were fitted, the caps or plugs from these may be used.

The plunger of the fuel distributor is to be fitted with a protective cap of adequate size, or secured to the fuel distributor.

In addition, the assemblies are packed in tightly packed, well-sealed plastic sleeves. Fuel distributors and warm-up regulators are packed individually.

If components arrive damaged due to incorrect packaging or do not comply with these instructions, they can be returned and the warranty claim rejected.

BOSCH Geschäftsbereich KH Kundendienst, Kfz-Ausrüstung.

After-sales Service

Technical Bulletin

Securing of idle-speed adjusting screws

K-Jetronic (CIS)

438

VDT-I-438/102 B
11.1976

According to a statutory regulation, changes have been made to § 47 of the German traffic licensing laws concerning exhaust gases and their outlets. This regulation was printed in full in traffic law sheet 13 of 15.7.75 .

Consequently, all motor vehicles with external-ignition engines must have their idle-speed adjusting devices secured from the 1st October 1976, so that adjustment of the screw is impossible without destroying the securing device. This should stop unskilled people from adjusting the installation of the idle-speed system and thereby illegally influencing the emission values. As from now, securing caps can only be used in the workshop and cannot be sold to customers for their own use.

Securing caps are produced in various colors. For after-sales service the following caps and colors are used:

downdraft air-flow sensor	
Blue	securing cap is not available from BOSCH. Part number is DB 000.997.59 86 from the Deutsche Vergaser Gesellschaft K 34 520
updraft air-flow sensor	
Red	Part number 3 430 522 002

These stipulations are only valid in countries where ECE regulations (Economic Commission for Europe) apply. The air-flow sensors must however be converted for the use of these securing caps, as a matter of principle. The caps can also be used in countries not subject to ECE regulations, to prevent dirt penetrating through the pipe to the adjustment in the case of updraft air-flow sensors.

BOSCH Geschäftsbereich KH Kundendienstl. Kfz-Ausrüstung

After-sales Service

Technical Bulletin

EXCHANGEABLE NON-RETURN VALVES
in electric fuel pumps 0 580 254 ..

VDT-I-438/104 En
3.1983
(Replaces Ed. 5.1982)

Electric fuel pump	Parts set (non-return valve + seal ring)	Non-return valve	Seal
0 580 254 001	1 587 010 500	---	---
002	500	---	---
0 580 254 003	502	---	---
004	502	---	---
005	502	---	---
006	502	---	---
007	500	---	---
948	005	---	---
949	002	---	---
950	006	---	---
951	006	---	---
952	002	---	---
953	501	---	---
954	002	---	---
956	002	---	---
957	002	---	---
958	002	---	---
959	002	---	---
960	002	---	---
961	002	---	---
962	002	---	---
963	005	---	---

BOSCH Geschäftsbereich KH Kundendienst, Kfz-Ausrüstung

Electric fuel pump	Parts set (non-return valve + seal ring)	Non-return valve	Seal ring
0 580 254 964	1 587 010 002	---	---
965	002	---	---
966	002	---	---
967	002	---	---
968	002	---	---
969	002	---	---
970	002	---	---
971	002	---	---
972	002	---	---
973	002	---	---
974	002	---	---
975	003 ④	---	---
976	004 ③	---	---
977	004 ③	---	---
978	1 587 410 901	---	---
979	010 004 ③	---	---
980	002	---	---
981	002	---	---
982 ①	003 ④	---	---
982 ②	1 587 410 901	---	---
984	010 004 ③	---	---
985	---	1 583 385 006	1 580 203 002
986	---	386 011	001
987	---	008	001
988	---	008	001
989	---	008	001
990	---	385 004	002
991	---	004	002
992	1 587 010 001	---	---
996	---	386 011	001
998	---	385 004	002
9 580 234 003	002	---	---
005	002	---	---

1 = up to FD 822 2 = from FD 823

3 = Parts set ..003 also possible (delivery-line connection at 90°)

4 = Parts set ..004 also possible (delivery-line connection axial)

After-sales Service

Technical Bulletin

HOT-STARTING PROBLEMS

438

VDT-I-438/105 En
3.1980
Replaces Ed. 2.1980

K-Jetronic

Hot-starting problems can occur in various vehicles fitted with K-Jetronic. This means that when an engine is switched off whilst still hot and then switched on again after a short period, it does not start as well as it should.

The engine, the ignition system and the K-Jetronic system in these vehicles should be carefully checked. With the K-Jetronic particular attention should be paid to the:

complete system (in case of leaks),
injection valves (in case of leaks),
correct position of the air-flow sensor plate (rest position).

Instructions can be found in the vehicle-related repair manuals VDT-W-438/5.. .

If the engine still does not start satisfactorily when hot, even after checking, a timing relay can be fitted in K-Jetronic systems which are not equipped with a solenoid valve for reducing the control pressure as additional starting help.

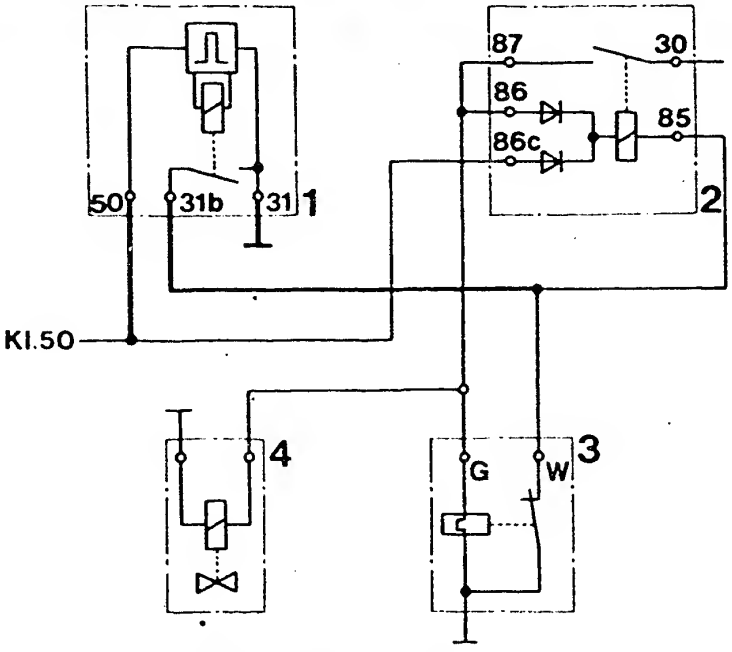
Timing relay 0 340 000 003 controls the start valve during hot starts. The start valve then injects extra fuel intermittently (sometimes cutting out completely.

The timing valve is fitted according to the wiring diagram (see reverse side). The fitting of this relay will be charged for.

After fitting the timing relay starting should be carried out as follows:

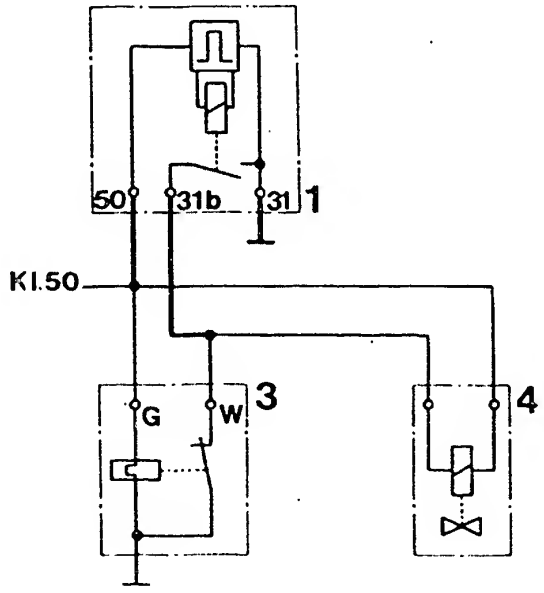
Vehicles with start valve in intake manifold - with open throttle valve,
Vehicles with start valve in idle duct - with closed throttle valve.

BOSCH Geschäftsbereich KH Kundendienst, Kfz-Ausrüstung



K-Jetronic system with post-injection relay

1 = Timing relay 0 340 000 003
2 = Post-injection relay
3 = Thermo-time switch
4 = Start valve



K-Jetronic system without post-injection relay

After-sales Service

Technical Bulletin

O-RING FOR K-JETRONIC INJECTION VALVES
0 437 502

VDT-I-438/108 En
7.1982

For K-Jetronic injection valves with O-ring seals the O-ring is available as a service part under Part No.: 3 430 210 600.

This O-ring is also listed on service-part microfiche EE...* together with other Jetronic service parts.

* See microfiche EE00 under 0 280 ..

Since the O-rings are exposed to extreme temperatures, they should be replaced whenever service work is performed.
"Unmetered air" which is drawn in through leaky injection valve seals is a frequent cause of trouble.

Please direct questions and comments concerning the contents to our authorized representative in your country.

BOSCH Geschäftsbereich KH Kundendienst Kfz-Ausrüstung

After-sales Service

Motor Vehicle Service Information

EXPORT VEHICLES WITH
EMISSION CONTROL SYSTEMS

VDT-I-Gen. 042 En.
12. 1981

K-Jetronic and L-Jetronic

Export vehicles for countries with stringent exhaust emission regulations are equipped with various emission control systems. To meet the legal requirements, these systems are installed either individually or in combination, depending on the model version.

Emission control system	installed predominantly in export vehicles				
	Sweden	Australia	Canada	USA	Japan
Exhaust-gas recirculation*	●	●	●	(●)	(●)
Secondary-air induction*	●	●	●	(●)	(●)
Secondary-air injection*	●	●	●	(●)	(●)
Catalytic converter*	-	-	-	●	●
Lambda closed-loop control	-	-	-	●	●

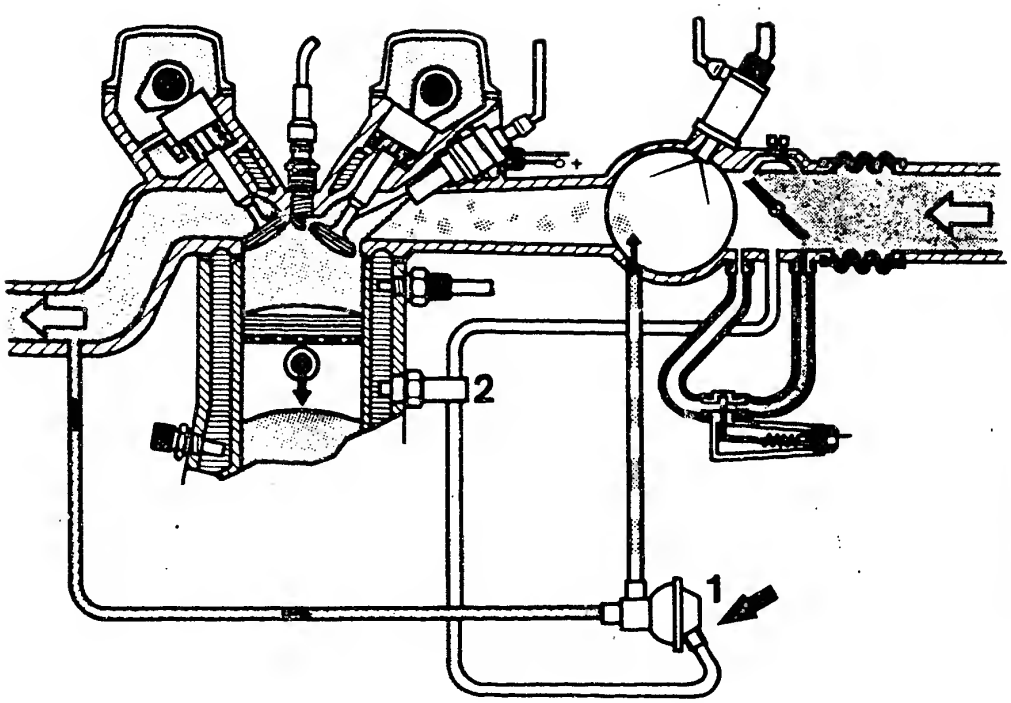
The vehicle-related After-Sales Service Instruction Manuals for the K-Jetronic and L-Jetronic describe the construction, function and operating principle of the emission control systems. The influence of these systems should be borne in mind particularly when adjusting the idle speed and CO concentration.

Export vehicles are sometimes also encountered in countries which do not have particularly stringent exhaust emission legislation. This Service Information publication summarizes the various emission control systems and provides information for the After-Sales Service in countries with exhaust emission legislation which does not require such emission control systems or unleaded fuel.

* Not made by Bosch

BOSCH Geschäftsbereich KH Kundendienst Kfz-Ausrüstung

1. Exhaust-gas recirculation (EGR)



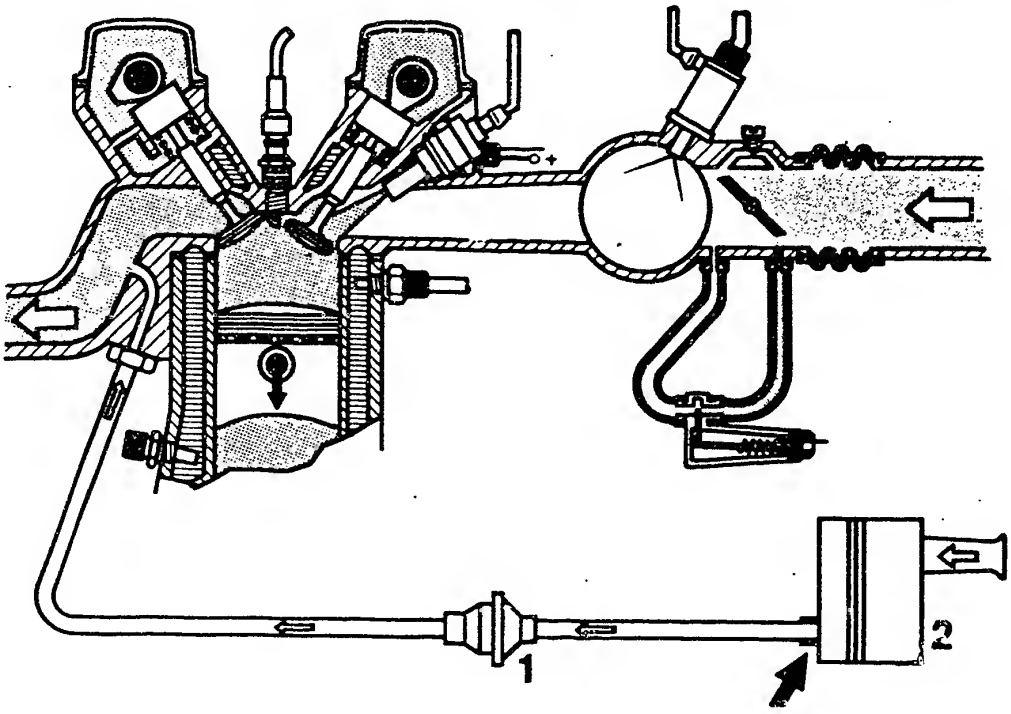
1 = Exhaust-gas recirculation valve 2 = Thermo-valve

Some of the exhaust gas is returned to the intake manifold via a vacuum-controlled exhaust-gas recirculation valve. This recirculation of exhaust gas into the combustion chamber lowers the combustion temperature and reduces the emission of nitrogen oxides (NOx). The thermo-valve and the position of the vacuum tapping port on the throttle-valve assembly ensure that exhaust gas is only recirculated when the engine is warm and only at part load. There is a reduction in engine speed of about 200 min^{-1}. Exhaust-gas recirculation is inoperative at idle, full-load and when the engine is cold.

When testing or adjusting the idle speed and CO concentration, remove and seal off the vacuum control line (arrow) on the exhaust-gas recirculation valve in order to ensure that the exhaust-gas recirculation system is inoperative.

In countries without stringent exhaust emission legislation it is not necessary to shut down the system.

2. Secondary-air induction (e.g. Volvo Pulsair system)



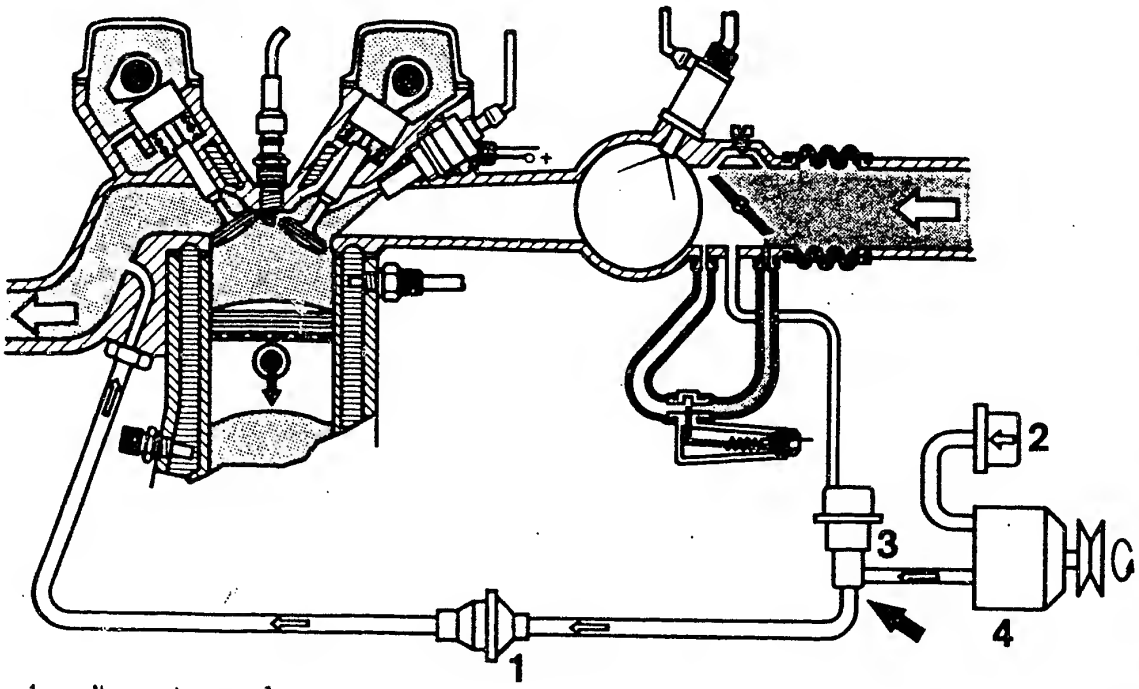
1 = Non-return valve 2 = Air filter

The pulsating alternation between overpressure and depression in the flow of exhaust gas inducts fresh air into the exhaust ports via a non-return valve. Unburned residues of carbon monoxide (CO) and hydrocarbons (HC) are partially after-burned, leading to fewer pollutants in the exhaust gas.

When testing or adjusting the idle speed and the CO concentration, the secondary-air induction system must be rendered inoperative. To do this, remove the hose between the non-return valve and the air filter on the air filter (arrow) and seal off tight with a plug.

In countries without stringent exhaust emission legislation it is not necessary to shut down the secondary-air induction system.

3. Secondary-air injection



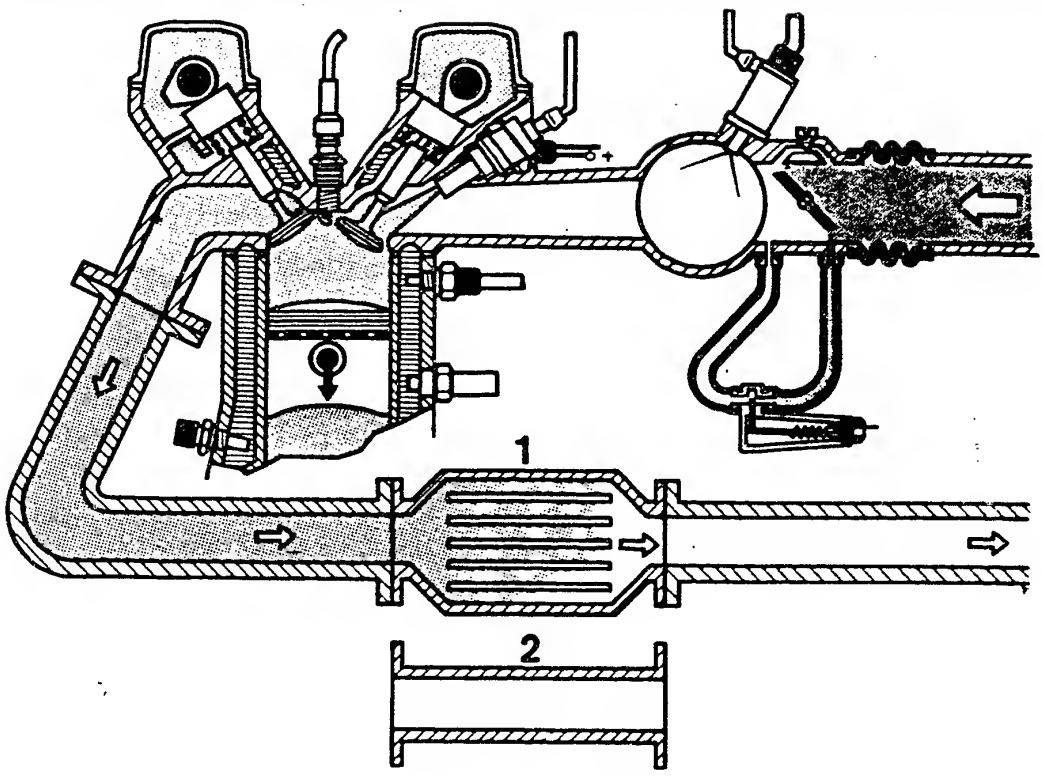
1 = Non-return valve
2 = Air filter
3 = Change-over valve
4 = Air pump

An air pump driven by the engine inducts fresh air through the air filter and forces it via a non-return valve into the exhaust ports. As in the case of secondary-air induction, there is a partial after-burning of the CO and HC residues. This makes the exhaust gas cleaner. A vacuum-controlled change-over valve controls the operation of the secondary-air injection system.

When testing or adjusting the idle speed and the CO concentration, shut down the secondary-air injection system. To do this, remove the hose from the outlet of the change-over valve (arrow) and seal off tight with a plug.

In countries without stringent exhaust emission legislation it is not necessary to shut down the secondary-air injection system.

4. Catalytic converter



1 = Catalytic converter 2 = Intermediate pipe

The single-bed catalyst installed in the exhaust system in export vehicles (also with lambda closed-loop control) reduces all three pollutants CO, HC and NOx to a minimum. The catalytic surface triggers chemical reactions of the pollutants, rendering them non-toxic.

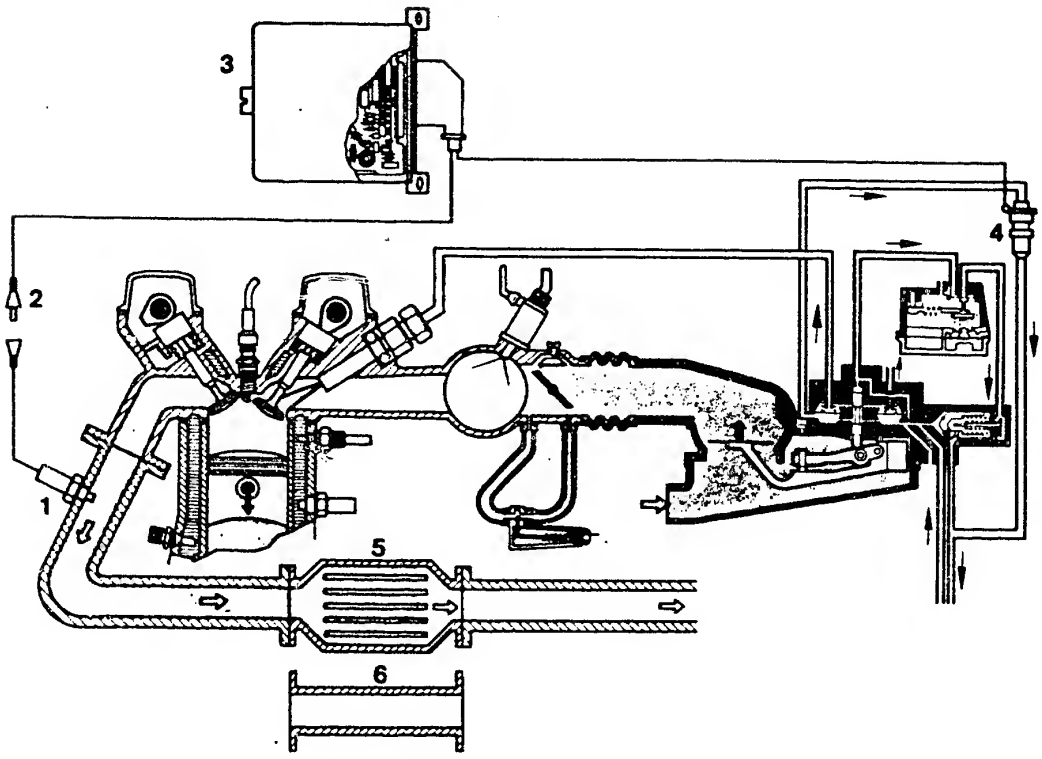
Important: Proper operation only possible in conjunction with unleaded fuel (at present only in USA and Japan).

When testing or adjusting the idle speed and the CO concentration, the catalytic converter can be neglected since the exhaust-measuring point is upstream of the catalyst.

Caution!

If the vehicle is operated on leaded fuel (predominantly in countries without stringent exhaust emission legislation) the catalytic converter must be removed. If not removed, the catalytic converter would become clogged up and lead to a reduction in the power output of the engine.

Appropriate intermediate pipes for converting the exhaust system are available from the vehicle manufacturer.



1 = Lambda sensor
2 = Plug
3 = Control unit
4 = Timing valve
5 = Catalytic converter
6 = Intermediate pipe

Export vehicles for the USA and Japan are equipped with lambda closed-loop control. This additional function of the K-Jetronic or L-Jetronic is not a downstream emission control system, but ensures a low pollutant content in the exhaust gas by means of optimum mixture preparation. Additional exhaust-gas recirculation, secondary-air induction or secondary-air injection is therefore not necessary in most cases. Like the catalytic converter, the lambda sensor (in the exhaust gas) operates only with unleaded fuel.
If the vehicle is operated on leaded fuel, the lambda sensor becomes clogged up and ceases to operate. The control unit detects this and switches from closed-loop to open-loop control. The system then operates on a fixed air-fuel ratio in the same manner as a K-Jetronic or L-Jetronic without lambda-closed-loop control. Before operating on leaded fuel, the lambda sensor should be removed and the installation hole should be closed off with a screw plug M18x1.5 (length of thread max. 8.5 mm). The disconnected plug (2) of the sensor connecting cable should be insulated and fastened to a suitable place on the vehicle body.

Caution!
Under no circumstances must the control unit or the timing valve be shut down on the lambda closed-loop control of the K-Jetronic.
The catalytic converter should be replaced by an intermediate pipe.

Published by:
Robert Bosch GmbH
Division KH
After-Sales Service Department
for Training and Technology
(KH/VSK)

After-sales Service

Motor Vehicle Service Information

HOT-STARTING PROBLEMS

VDT-I-Gen. 050 En

9.1982

on vehicles fitted with Jetronic

Customer complaints

If the vehicle is parked and the engine switched off after having been run at normal operating temperature, it often occurs that the engine proves difficult to start, or won't start at all, and when it does start it runs extremely roughly (only on 2 or 3 cylinders). The engine has to be accelerated a number of times before it runs smoothly.

Causes

For economic reasons ("stretching" of the mineral-oil reserves), it can happen that alcohol in varying quantities has been added to gasoline. Methanol is used for instance.
Such alcohol-added fuels, depending upon the amount of alcohol, adversely affect the hot-starting characteristics of the engine. The addition of alcohol raises the vapor pressure of the fuel and the result is that the boiling point of the alcohol-fuel mixture drops. This in turn leads to the formation of fuel-vapor locks in the fuel system when the engine has been switched off.

This means that when starting, and during the subsequent idle period, the air-fuel mixture is temporarily too lean.

Remedies

- Check the ignition and Jetronic systems, particularly for leaks.
- Changing to another brand of gasoline can sometimes cure the problem immediately.
- In many cases, fully depressing the gas pedal helps during starting, as does slightly depressing the gas pedal during the idle period until the engine runs smoothly.
- Fit the pulse relay 0 340 000 003 (refer also to VDT-I-438/105) in vehicles with K and D-Jetronic.
  This step, though, will still not fully alleviate the rough running of the engine during the starting off phase

Note:

The pulse relay 0 340 000 003 is NOT to be installed in vehicles fitted with L-Jetronic.

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After-sales Service

Motor Vehicle Service Information

COLD START - WARM UP
ACCELERATION PROBLEMS

VDT-I-Gen. 051 En
10.1982

in vehicles with Jetronic

Customer complaints

- Starting problems with a cold engine
- Engine bucking during warm up
- Uneven idle (speed fluctuations)
- Engine cuts out during acceleration (flat spot)
- Loss of output

Cause

When the ignition and the Jetronic have been checked and the test specifications given have been reached, a possible reason for the problems quoted could be coke residue on the intake valves.

The carbon residue thus present delays a continuous flow of fuel from the injection valve to the combustion chamber on account of its sponge effect.

As a result of this the air-fuel mixture can in some cases be so lean, that it can no longer be ignited.

Loss of output results from a reduction in the amount of cylinder filling and is caused by a very high coking.

Complex connections between qualities specific to the engine, the engine oil and fuel used, as well as relevant driving cycles (e.g. mainly short stretches) can cause such coking on the intake valves.

Remedy

Dismantle the intake valves and remove the deposits.

Please note

Various vehicle manufacturers are working at the moment on other measures, such as cleaning with additives. Results of these tests are not yet available.

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After-sales Service

Motor Vehicle Service Information

LIQUID PETROLEUM GAS (AUTOGAS) SYSTEMS AND VEHICLES WITH K-JETRONIC

VDT-I-Gen. 052 En
10.1982

Fitting at a later stage

Vehicles with K or L-Jetronic are not suitable for fitting at a later stage with liquid petroleum gas (LPG) systems.

Numerous problems can occur, such as:

- Reduction of fuel flow through the injection valves due to deposits
- Stiffness or blocking of the K-Jetronic fuel distributor plunger (due to gumming or similar) in the course of time with "gas only operation."
- Increased danger of backfiring in the intake manifold (burbling) and thereby damage to the air-flow sensor.

Guarantee

Guarantee claims for failed Jetronic components from vehicles thus converted will not be accepted.

Conversion to liquid gas operation is made at the risk of the vehicle owner.

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After-sales Service

Motor Vehicle Service Information

AUDI 80 GLE (4000 USA)

Fuel pump noises

VDT-I-AUD 012 En

12.1979

In the Audi 80 GLE up to chassis no. 8 192 202 910, date of manufacture 4.79, the fuel pump may produce noises if the tank contains less than 10 l of fuel. The fuel gauge is then already in the red range.

Cause

The fuel-return pipe is above the level of the fuel. Air bubbles are formed in the return flow of fuel which are then sucked in by the fuel pump.

AUDI have already remedied this complaint in the series.

Remedy

Inform the customer of the cause of the problem and make him aware of the need to refuel in good time. The noise will then be avoided.
If necessary refer the customer to an AUDI representative.

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Table of contents

Table of contents (continued)

Published by: After-Sales Service, Department for Training and Technology (KH)VSK). Press date: 4.1983

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Microfilmed in the Federal Republic of Germany.
Microphotographié en République Fédérale d'Allemagne.